THE IRON TRADE REVIEW

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Idle Capacity to Increase

Many Mills to Shut Down Next Week For Mid-Year Inventory and Repairs —Railroad Buying Shows a Slight Improvement

With the advent of the mid-year, idle capacity in all branches of the iron and steel industry will be increased sharply. Many mills are preparing to shut down for periods varying from two weeks to a month for making alterations and repairs and 18 independent sheet and tin plate plants operating under the Amalgamated scale close June 30 for an indefinite period. The demand of the association for slightly increased wages was refused by the manufacturers and the conference adjourned without effecting an agreement for the year beginning July 1. Operations on the Lake Superior iron ranges are being greatly curtailed. The Stevenson mine, one of the biggest producers on the Mesabi range, has been placed on the idle list, and Oglebay, Norton & Co., of Cleveland, have ceased operations on the Bristol, Chatham and Berkshire mines on the Menominee range, the Empire on the Marquette, Montreal on the Gogebic and Woodbridge on the Mesabi. Few of the mines are being operated to their normal output and it is predicted that shipments from the great Mesabi range will show a decline of from 12,000,000 to 15,000,000 tons from the movement of last year, when 32,000,000 tons were shipped. During the month of July additional merchant blast furnace capacity will be placed on the idle list. Mills and blast furnaces will carry over into the second half a large unspecified tonnage not taken by consumers on contracts for shipment during the first six months of the year. No effort is being made by producers to readjust these contracts, although in several instances this has been done to meet the wishes of the users.

Pig Iron

Activity in pig iron is limited almost entirely to the east and the Cincinnati district, but prices are not yielding as operators have reached, and in some centers have crossed the cost line. The tunnel segment contract for 75,000 tons of castings has been divided between the Wheeling Mold & Foundry Co., Wheeling, W. Va., and the New York Car Wheel Co., Buffalo. The pig iron requirements for this order, estimated at 40,000 to 50,000 tons, has not been placed, although it is certain that the iron will be shipped from Buffalo and either valley or southern Ohio furnaces. The General Electric Co. is in the market for 12,500 tons of foundry iron, and the Standard Sanitary Mfg. Co., Pittsburgh, shortly will cover the needs of all of its plants through the last half. In the east two orders are pending for 5,000 and 7,000 tons, respectively. Corrigan, McKinney & Co., Cleveland, will proceed immediately with the erection of two blast furnaces to serve its steel plant now in course of construction.

Iron and Steel Bars

The great bulk of the implement tonnage of iron and steel bars remains unplaced, the mills, with one or two exceptions, refusing to quote beyond the first of the year. Scattering sales of steel bars in 500 and 1,000-ton lots are being made at 1.10c, Pittsburgh, but for six month's delivery the price of 1.15c, Pittsburgh, is firmly established. For shipments beyond the first of the year one mill is quoting 1.20c. Bar iron continues weak and as low as 1c has been done at Chicago.

Car Buying

Car buying has improved and the railroads are placing contracts more freely than at any time this year. The Illinois Central has increased its order from 3,000 to 5,000 cars. That the railroads contemplate an increase in track work is indicated by the demand for rail fastenings. The Carnegie Steel Co. has taken 1,000 tons of tie plates and western mills report greater activity. The St. Louis & San Francisco railroad has placed an order for 32,000 tons of rails with the Tennessee Coal, Iron & Railroad Co. The American Bridge Co. was awarded 7,000 tons for a hotel at Pittsburgh; Corrigan, McKinney & Co., Cleveland, are considering bids for 3,500 tons of plates and shapes for two blast furnaces and an Ohio manufacturer has closed his six months' requirements of structural material aggregating 1,200 tons. The Illinois Central is reported in the market for 30,000 steel underframe cars.

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New Fields for Engineers

AN IMPORTANT feature of a number of recent addresses at college commencements and before engineering societies has been the earnestness with which speakers have dwelt upon the increasing demand for engineers in public service. In an address before the Cleveland Engineering Society, Charles Whiting Baker, editor-in-chief of *Engineering News,* declared that whether we like it or not, there is certain to be increasing regulation of public utilities and big business, and if this regulation is to succeed, the engineer must be depended upon to a very large extent. At the meeting of the American Society of Mechanical Engineers at St. Paul last week, H. L. Gantt, vice president of the society, called attention to the necessity for engineers to assume more prominent positions in public life, in order that through their efforts people may be taught the true bearing of present economic problems.

One of the most important commencement addresses of the year was that at Worcester Polytechnic Institute by Professor Mortimer E. Cooley, dean of the department of engineering of the university of Michigan. Speaking along lines similar to those of Messrs. Baker and Gantt, Dean Cooley gave a concrete example of public service in which the work of the engineer will be highly important. He said that the valuation of the railroads by a federal board, which has already been begun, is a stupendous task in its details and still more stupendous in its possibilities of application. He added: "It behooves the engineers intrusted with the work to see that it is well done, and all done. It will require great stamina and strength of character and rare judgment to produce true results. It is one thing to produce the results and another thing to have them believed. The engineering profession at large, therefore, has a direct interest in the conduct of the work and its welfare. The profession should not stand aloof, but interest itself now at the beginning and until the last figure is made."

Dean Cooley insisted that if we are to obtain the best results in the future, it must be from a broader aspect of engineering than has been necessary in the past. He also spoke of the labor question. He said that the fact that this question appears rapidly to be coming into politics must greatly interest the student of history, reminding him, as it must, of legislative acts relating to labor during the decline of the Roman empire. "Would it not," he said, "be well for us all, labor leaders, legislators, citizens, to devote a little more time to our history? Might we not be quite as well off in our schools if we should check our impetuous rush towards vocational subjects and give more time to things good for us as a people—as the whole people?"

Under the leadership of such broad men as Cooley, Baker and Gantt, engineering in its broader aspect is being most impressively presented and they are rendering a public service of the highest order. It behooves engineers in general to follow their lead, to take a livelier interest in public affairs and study more thoroughly the lessons of history.

The Crime of Holding a Watch

THE most humiliating spectacle of a big, brainy man cowering before the labor unions of the country is furnished by Senator Borah, of Idaho, whose bill, introduced a few days ago in the Senate to prevent the use of the stop watch on government work and the payment of premium or bonus to government employes, shows how far even a member of the greatest deliberate body in the country will go in catering to the labor union vote.

The Borah bill makes it a crime, punishable by a fine of not more than $500 or imprisonment of not more than six months, or both, for any one in charge of work of the United States government to use the stop watch in studying the movement of any employe. The provision is so manifestly absurd as not to be worthy of argument.

The bill also declares that it shall be unlawful to pay any employe of the government any premium or bonus as wages or otherwise. It is, however, provided that the terms "premium"

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and "bonus" shall not be construed to include any cash reward for suggestions, patents or devices resulting in improvement or economy of operation. How kind the Senator is to add this proviso! The giving of a Christmas present as a premium or bonus would be criminal, but suggestions and patents may be paid for.

If anyone thinks he can compete with Borah in adding to Washington's curios of legislation, he will be compelled to exercise all his ingenuity and, in addition, take lessons in the most contemptible forms of obsequiousness to labor agitators.

Railroad Securities

GENERAL approval should be given to the position taken last week by Attorney Louis D. Brandeis, who appeared before the Senate Committee on Interstate Commerce and protested against the Interstate Commerce Commission being burdened with the supervision of the issuance of railroad securities.

That body is already weighted down with many tremendous duties, involving matters which are most vital to the industrial welfare of the country. To further load upon it great responsibilities, such as the Rayburn anti-trust measure proposes, would be unfair to the public, the railroad and the shipper. Being a quasijudicial organization, the Commission should not be called upon to perform tasks which would divide its time, dissemble a deliberative mind, and do general injury. Representative J. W. Alexander, in his bill against the so-called shipping trust, would empower the Commission to supervise foreign and domestic water rates and other affairs pertaining to vessel traffic the same as it now supervises railroad traffic. The bill would increase the Commission membership from seven to eleven members.

While this plan would perhaps afford an ample number of commissioners to perform its increased duties, it might be well worth while to consider the fact that large bodies become unwieldy. It is a form of decentralizing authority and eliminating expediency. Opinions would vary more than ever, prolonged discussions upon issues would prevail, delays follow and in the end the thought given the cases would be no abler. It would effect an injury to litigants and the country at large.

James M. Swank

JAMES M. SWANK will be remembered always as the man who put the United States ahead of all nations in the collection of statistics of the iron and steel industry. Prior to the time when Mr. Swank began his labors, some 40 years ago, little had been done by any nation toward the systematizing of statistics of any industry. Mr. Swank's fame might well rest on his achievement as a statistician. He was, however, much more than a statistician. He had the genius of the historian. His "Iron in All Ages" is an invaluable compilation of facts and his "Progressive Pennsylvania" and other works entitle him to high rank as a contributor to the history of his times.

As an unfaltering, uncompromising advocate of the protective tariff, Mr. Swank rendered service of great importance to his country. He believed in the protective tariff with all the intensity of his being. He resented any attack upon the protective system and always was ready with facts and figures to combat every assault. He was an American through and through. It pained him to have American industries deprived of making anything that could be made by American workingmen. Of Judge Kelley, William McKinley, and other stalwart advocates of the protective policy, Mr. Swank was a staunch supporter.

James M. Swank will be known to the world as statistician, historian and supporter of protection, but by those who knew him personally, he will also be remembered as a strong, lovable man. The late John Fritz said a few years ago: "Mr. Swank is an able man and he is as modest as he is able. To know him intimately is to respect him. He is a stranger to deceit and stands for all that is fair between man and man."

No photograph does Mr. Swank justice. He was a man of commanding presence and yet as gentle as a child. He was ever ready to help others, especially younger men, and endeared himself to all who came in contact with him.

A great industry is better because it had for so many years in its service this true man.

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for June, 1913. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for May, 1914.	Average for March, 1914.	Average for June, 1913.
Bessemer pig iron, Pittsburgh..	$14.90	$14.90	$15.15	$17.26
Basic pig iron, Pittsburgh.....	13.90	13.90	13.96	15.46
No. 2 Fdy. pig iron, Pittsburgh	13.90	14.09	14.15	15.04
Northern No. 2 Fdy., Chgo....	14.00	14.25	14.25	16.00
Lake Superior Charcoal, Chgo..	16.00	15.75	15.50	16.75
Malleable Bessemer, Chicago...	14.00	14.25	14.25	15.75
Southern No. 2, Birmingham...	10.25	10.50	10.50	10.70
Southern Ohio No. 2, Ironton.	13.50	13.50	13.50	14.70
Basic, eastern Pa.....	14.00	14.00	14.25	16.00
No. 2X Virginia furnace.....	12.75	12.75	12.75	13.75
No. 2X Foundry, Philadelphia.	14.75	15.00	15.00	16.25
Ferro manganese, Baltimore....	38.00	38.00	38.50	61.00
Bessemer billets, Pbgh. & Ygn.	19.50	20.00	21.00	26.50
Op. h'th billets, Pbgh. & Ygn.	19.50	20.00	21.00	26.50
Bess. sheet bars, Pbgh. & Ygn.	20.50	21.00	22.00	27.50
Op. h'th sh. bars, Pbgh. & Ygn.	20.50	21.00	22.00	27.50
Steel bars, Pittsburgh.....	1.10	1.15	1.20	1.40
Iron bars, Philadelphia.....	1.17	1.22	1.25	1.52
Steel bars, Chicago.....	1.28	1.29	1.38	1.58
Tank plates, Chicago.....	1.28	1.29	1.38	1.63

	Today's prices.	Average for May, 1914.	Average for March, 1914.	Average for June, 1913.
Structural shapes, Chicago.....	$1.28	$1.29	$1.43	$1.63
Iron bars, Cleveland, local del'y	1.20	1.25	1.30	1.65
Iron bars, Chgo. mill.....	1.05	1.10	1.57	1.55
Beams, Pittsburgh	1.10	1.15	1.20	1.45
Beams, Philadelphia	1.25	1.30	1.30	1.60
Tank plates, Pittsburgh.....	1.10	1.12½	1.20	1.45
Tank plates, Philadelphia.....	1.25	1.25	1.30	1.75
Sheets, blk., No. 28, Pittsburgh	1.80	1.87	1.95	2.28
Sheets, blue an., No. 10, Pbgh.	1.35	1.37	1.40	1.75
Sheets, galv., No. 28, Pbgh....	2.75	2.80	2.95	3.39
Wire nails, Pittsburgh.....	1.50	1.57	1.60	1.78
Connellsville fur. coke, contr...	1.85	2.00	2.00	2.25
Connellsville fdy. coke contr...	2.40	2.50	2.50	3.00
Heavy melting steel, Pbgh.....	12.00	12.00	12.25	13.06
Heavy melting steel, east'n Pa.	10.75	10.75	11.25	12.50
Heavy melting steel, Chgo.....	9.75	9.95	9.80	12.00
Heavy cast, eastern Pa.....	12.50	12.50	13.00	13.50
No. 1 wrought, eastern Pa.....	12.50	12.50	14.50	15.50
No. 1 wrought, Chgo.....	9.00	8.63	9.00	11.25
Rerolling rails, Chgo.....	11.25	11.25	11.25	14.00
Car wheels, Chgo.....	11.25	11.38	11.75	17.00

(For Additional Prices See Page 1148.)

Pig Iron More Active in East

Buffalo Furnaces Will Furnish Iron For Half of Tunnel Segment Contract —Two New Furnaces at Cleveland

In the New York pig iron market prices show a strengthening tendency. There is a fairly large tonnage of pig iron under inquiry and sales show no falling off from the preceding few weeks. The General Electric Co.'s inquiry is the largest business now under negotiation. This involves an aggregate of 12,858 tons, which comprises the following: 2,600 tons of high silicon, 2,500 tons of medium silicon and 850 tons of low silicon for last half, delivery at Schenectady; 4,500 tons of high silicon for Pittsfield and Lynn and 2,300 tons of low phosphorus for Everett and Lynn. A large portion of the inquiries now before the trade have not been submitted generally, but are being figured on quietly by one or two sellers. Among these inquiries, one for 5,000 to 7,000 tons and one for 1,000 tons are pending. A New Jersey consumer is inquiring for 300 tons of foundry. A fair demand is reported for Virginia iron, sales last week totaling about 2,000 tons. The largest sales were of 450 tons each to consumers in the locality of Boston. The furnace price for No. 2X Virginia iron continues firm at $12.75. The price of Buffalo No. 2X appears to be firm at $13, furnace, and the $12.75 quotation is no longer made.

In the consuming territory of which Philadelphia is the center, both sales and inquiries have increased in volume and the tone of the market is somewhat better. Most of the recent activity has been in foundry iron. A Virginia pipe maker has taken 1,000 tons of No. 3 southern on a basis of $10.50, Birmingham, for No. 2. A Trenton radiator plant has taken at least 500 tons, and probably as much as 1,500 tons of No. 2 plain Pennsylvania iron. Another Trenton foundry has closed for 600 tons of No. 2 and No. 3. The Norfolk & Western has closed for the balance of its 2,000-ton inquiry, involving Virginia charcoal iron, Bessemer and foundry. A Reading foundry has taken 500 tons of No. 2X and a Salem, N. J., interest 500 tons of No. 3. A Philadelphia melter closed for 100 tons of No. 3. Numerous other sales, involving from 500 tons downward are reported. There has been a good demand for Virginia iron, in small lots, especially from New England. Some low prices are rumored on Virginia iron, but these appear to be due to a sacrifice of a portion of their commission by selling agents rather than a concession in the furnace price. Other prices appear to be firmly adhered to. A Reading foundry is inquiring for 600 tons, ranging between 2.50 and 3.50 in silicon and under 0.05 in sulphur. A New Jersey pipe maker is in the market for a tonnage which probably will be closed for about July 1. The Southern railway's inquiry includes 300 tons of foundry, 2 per cent silicon or over, and 140 tons of gray forge. Basic is dormant and has not figured much in the transactions of the week. A Harrisburg melter is reported to have closed for its third quarter requirements of basic and to be figuring on fourth quarter. Sales of standard low phosphorus last week aggregated several hundred tons. There has been a good demand for Lebanon low phosphorus iron, one eastern Pennsylvania consumer taking 2,400 tons. A few small sales of Swedish charcoal iron are reported.

Pittsburgh Pig Iron Looking Upward

Although there has been no change in the actual situation, the pig iron market at Pittsburgh offers a better tone. The Wheeling Mold & Foundry Co., Wheeling, W. Va., which will furnish about half of the cast iron segments for East river tubes, New York, has practically closed negotiations for miscellaneous grades of foundry pig iron in the Pittsburgh district. The New York Car Wheel

(*For complete prices see page* 1148)

Co., Buffalo, which will furnish about the same tonnage of cast iron segments, will receive its metal from a Buffalo furnace interest. The Wheeling and the Buffalo interest will each require from 35,000 to 40,000 tons of iron, which will be shipped during the next two years. The Standard Sanitary Mfg. Co., negotiating for foundry grades for plants at Allegheny and New Brighton, Pa., and Louisville, Ky., has not yet awarded contracts. Several indefinite negotiations have been opened for basic, and a local steel casting interest has taken 1,500 tons of Bessemer, at $14, valley, for last half delivery.

Buffalo Sales Light

Sales in the Buffalo district for the week amounted to approximately 5,000 tons of all grades. The inquiry is not as active as it was a week ago. The absence of distinctive grade differences in the schedule of prices continues, with $13 being the minimum quoted.

Foundries in Buffalo and vicinity practically all report little activity. The New York Car Wheel Works, Buffalo, has been awarded 40,000 tons of the segment castings order for the new New York tubes under East and North rivers. This will require about 30,000 tons of pig iron and may go to one local furnace or be divided among several of the producing interests of this section.

Of more than ordinary interest to pig iron consumers in the Cleveland district is the announcement that Corrigan, McKinney & Co. will immediately proceed with the erection of two blast furnaces to provide iron for their new steel plant, and undoubtedly a considerable tonnage will be available for local interests. Demand continues unusually light, although one sale of 2,000 tons for last half delivery, to be shipped from a Toledo furnace, is reported. While the market is nominally $14.25 for No. 2 for prompt shipment, $14 has been done. The furnaces will carry into the last half a considerable unspecified tonnage purchased for shipment during the first six months.

Better Inquiry at Cincinnati

The Lima Locomotive Corporation, Lima, O., is inquiring for 1,000 tons of northern foundry iron, and the Wickham Piano Plate Co., Springfield, O., is asking for prices on 1,000 tons of northern No. 2. The Avery Mfg. Co., Louisville, wants 850 tons of high silicon foundry iron. The Standard Sanitary Mfg. Co. has not closed its inquiry for 1,000 tons of northern and the same tonnage of southern foundry iron for delivery to its Louisville plant, mentioned last week. The Davis Sewing Machine Co., Dayton, O., has closed for 450 tons of northern and 450 tons of southern foundry iron, and a Galion, O., manufacturer has taken 1,000 tons of northern foundry grades. A Springfield, O., melter has purchased 900 tons of southern No. 2 foundry at $14.15, delivered. Central Ohio melters have taken 2,000 tons of basic and 500 tons of foundry iron. One furnace in Tennessee is still holding at $11, Birmingham basis, for No. 2 foundry for last half delivery, but $10.25 and $10.50, Birmingham basis, can easily be done in this territory. Southern Ohio furnaces are holding at $13.50, Ironton basis, for No. 2 foundry for last half shipment.

Inquiry is Less Active

Sellers of pig iron in the Chicago district find inquiry is slackening somewhat and while a considerable number of melters are seeking tonnage, their individual requirements for the most part are small and no large tonnages are in evidence at present.

Melters of basic iron apparently bought as much as they desired several weeks ago and the inquiry now for the most part is for foundry grades and malleable. The total tonnage of these under consideration is considerable and covers a wide territory without single items being of magnitude.

While some furnaces are holding at $14.25, Chicago, for No. 2 foundry and malleable, contracts for third quarter are being made at $14, Chicago furnace, and it is believed a few sales have been made at $13.75, Chicago furnace, for delivery in competitive territory. Such contracting as is being done extends only through third quarter and while some tentative inquiry for fourth quarter delivery is being received it does not result in sales.

A St. Louis agent sold 1,500 tons of northern iron and 1,500 tons of southern to a concern at Waterloo, Ia., as well as several small lots. This was about the only pig iron business transacted in St. Louis last week. Inquiry is confined to small tonnages. Southern No. 2 continues to be quoted at $10.25, $10.50 and $11, Birmingham. Northern iron is held at $14.25, Chicago furnaces, and $13.50, Ironton.

Southern Iron Quiet

Birmingham blast furnace operators report the demand for southern iron exceedingly limited and sales are mostly for small lots for immediate shipment. For spot deilvery, $10.25, No. 2 Birmingham continues to be quoted and $10.50 is asked for the third and fourth quarters. The Woodward Iron Co. blew in one furnace at Bessemer during the week, but otherwise the idle list continues unchanged.

(*For complete prices see page* 1148)

Billet Price

Weakness in semi-finished steel continues in the east.

Demand for billets in eastern Pennsylvania is of a spasmodic nature, and some contracts for third quarter are being booked at $21.90, delivered, for rolling steel, and $25.90 to $26.90 for forging billets.

Pittsburgh Semi-Finished Market Quiet

The market for billets, sheet bars, wire rods and muck bar in the Greater Pittsburgh district continues uneventful. Consumers are well under cover, and none of them is in need of additional material. Prices, although untested, appear to represent the market.

Ashland Steel Operating

The situation is quiet at Ashland. The Ashland Steel Co. is still running on new orders having resumed operations last week after a shutdown of about a month, but specifications are not heavy enough at the present time to warrant better business for several weeks at least. Prices are unchanged at $20 for billets and $25 for wire rods, both Ashland basis.

Ferro Market Quiet

Outside of sales of a carload now and then, the eastern ferro-alloy market is without life. Importers are maintaining no stocks, but buy only on account of immediate orders. Ferro-manganese continues to be quoted at $38, tidewater.

Pittsburgh Alloys Unchanged

The market for ferro-alloys in the Pittsburgh district is quiet. Sellers are asking $38, seaboard, for ferro-manganese, and some tonnage has been sold at that figure recently. Other alloys are quiet but unchanged.

The National Steel Rail Co., 1032 Pierce building, St. Louis, has consummated a deal with the Chicago & Alton railroad for the purchase of approximately 70 track miles of heavy section relaying rails, weighing 60, 70 and 80 pounds per yard. A considerable portion of this tonnage has been sold and will be shipped to an interurban line building in the southwest.

Sheet Mills to Close

Independent Manufacturers Fail to Reach Agreement With Amalgamated Association

Specifications for steel sheets are heavier than at any time since February, according to reports from leading makers in western Pennsylvania and eastern Ohio. There has been some new buying, but mills are refusing to sell at present price levels for extended deliveries. Prevailing quotations continue to represent the market, although blue annealed sheets show some irregularity. Mill operations are unchanged. The American Sheet & Tin Plate Co. is operating sheet mills at about 60 per cent capacity. Independent makers express no alarm over the probability of plants controlled by the Amalgamated Association of Iron, Steel and Tin Workers shutting down, June 30, because of failure to agree upon wages for the year beginning July 1.

The current demand for steel sheets in eastern Pennsylvania continues of the small-order variety, but inquiry for second half is better. The eastern producer last week did not operate to capacity as was the case for a few weeks preceding. The maker continues to quote 1.50c, Philadelphia, on No. 10 gage blue annealed.

Sheet Market is Weak

The situation in sheets in the Chicago market continues to show signs of weakness. Mills are hungry for tonnage for immediate delivery and prices are suffering in consequence. No. 28 gage black sheets may be obtained at 1.98c, Chicago, and comparatively little shading is heard for this quality. No. 28 gage galvanized, however, are not as firm as black and 2.88c, Chicago mill, is the going price with competition bringing the price frequently to 2.83c, Chicago.

A peculiar situation is developing with third quarter coming on apace with mill books almost devoid of tonnage and mills unwilling to take contracts into second half unless accompanied by specifications for immediate shipment. Contracts on the basis of present prices are not desired and buyers apparently are content to wait, believing they can get under cover unless an upturn appears.

Mills Close for Repairs

The sheet market is quiet, demand and specifications being light. The Newport Rolling Mill Co., Newport, Ky., will close on June 24 for its usual summer alterations and repairs. It is also reported that several other large makers will shortly close down their plants. No change in prices has occurred in this territory, near-by mills refusing to meet quotations made by some makers in adjoining territories. Black sheets, No. 28 gage, are held at from 1.90c to 2c; galvanized, No. 28 gage, from 2.85c to 2.95c, and blue annealed No. 10, 1.55c, all Cincinnati basis.

Plate Demand Improves

Requirements of Car Works Increase With Placing of Orders By Railroads

In New York, specifications on plate contracts are coming in at a better rate than last month and the feeling is improved. A good many manufacturers are sounding the market on contracts for third quarter and last half, but the mills are unwilling to accept anything beyond third quarter at the present basis. Prices continue firm at 1.26c to 1.31c, New York, or 1.10c to 1.15c, Pittsburgh. Most of the current business consists of lots ranging from 100 tons downward and the buyers mainly are boiler makers and ship yards. The Lukens Iron & Steel Co. has booked 250 tons of plates for Panama canal tug boats at a price understood to have been a little better than 1.10c, Pittsburgh.

Demand for plates in eastern Pennsylvania continues of a small lot, miscellaneous character, but is improved in volume over a week ago. One eastern Pennsylvania mill's bookings last week were at the rate of 80 per cent of capacity. Some buyers are desirous of closing for the second half, but the mills refuse. The price is firm at 1.25c to 1.30c, Philadelphia, or 1.10c to 1.15c, Pittsburgh. An offer from one consumer, to buy 15,000 tons of plates at a reduction of $1 a ton from the prevailing price, is reported to have been made last week without attracting a seller. Specifications continue to come in and the outlook is that not much tonnage will be left from first half contracts. The United States Steel Products Co. is reported to be the low bidder on 2,400 tons of plates for the Panama canal. These bids were opened June 19.

Pittsburgh Plates Still 1.10c

The market for plates, shapes and steel bars in the Pittsburgh district shows no definite improvement, although manufacturers appear more hopeful with reference to the future. Plates are selling at 1.10c, at which figure shapes and bars are going for prompt delivery. Specifications against contracts for all three products are running from 40 to 50 per cent above those received in the corresponding period in May, but May, it will be recalled, was a decidedly dull month.

Plates Gain No Strength

Plates in the Chicago market appear a shade weaker than the other finished steel products although some tonnage is being booked at the same rates as prevail for shapes and bars. Recent car orders, which were expected to be a benefit to the plate market, have not yet arrived at the point where the steel is being bought and this factor is absent from the market as a live issue. Quotations remain, however, 1.28c to 1.33c, Chicago with occasional attractive tonnages commanding 1.25c, Chicago, but not in sufficient volume to establish a market level.

(*For complete prices see page* 1148)

Wire Market Dull

The market for wire products in the Pittsburgh district is marking time, and manufacturers fear there will be no definite change in present conditions until autumn. Mills are getting ready for the usual mid-summer shut-downs, and the majority of them will be idle for a longer period than usual. Nails are listed at $1.50 a keg and plain wire at $1.30 for prompt shipment.

Wire Market Quiet

The wire market in Chicago is quiet and comparatively little business seems to be going except some for fencing purposes and quotations remain, plain wire $1.30 and wire nails $1.50, Pittsburgh.

Tubular Goods

The market for tubular goods in the Greater Pittsburgh district is not so active as it was a few weeks ago, although it is understood several important undertakings are being considered quietly. Prices are unchanged. The market for boiler tubes is irregular, although makers have made no change in card discounts.

Steel Bars Are Firm at 1.10c

Mills Refuse to Quote Beyond The End of the Year and Placing of Large Tonnages Deferred

In New York an improvement in demand is reported for steel bars and specifications on contracts are coming in in much better volume than last month. A large part of the current demand is from jobbers and bolt and nut manufacturers, but nearly all other classes of consumers are showing more interest in the market. Prices continue firm at 1.26c to 1.31c, New York, or 1.10c to 1.15c, Pittsburgh, and makers are not willing to contract beyond third quarter on this basis.

Steel Bars No Better

Bar steel in the Pittsburgh district has failed to develop strength; if anything, this product has reflected slight weakness, as sales for spot delivery now are being made at 1.10c. Makers are asking 1.15c for third quarter and 1.20c for fourth quarter shipment. Bar iron is nominally listed at 1.25c, Pittsburgh, but that figure has not been tested.

Implement manufacturers in the Cleveland district have been sounding the market and have been endeavoring to close 12 months' requirements on a basis of $1.10, Pittsburgh. The mills, however, refuse to name this price except for immediate delivery and for shipment through the remainder of the year they are asking $1.15, although one quotation has been made of $1.20 for delivery from Jan. 1, 1914. A considerable unspecified tonnage from the first half will be carried over on mill order books, there being no incentive on the part of the mills to cancel this tonnage, owing to the fact that prices have not advanced since these contracts were entered into.

Steel Bars Are Quiet

The greatest factor in the steel bar market in Chicago is the silent battle between producers and consumers, the latter in the present instance being mostly agricultural implement makers. With the near approach of July 1, when agricultural contracts are usually started, much interest is manifested in the desire of users to buy for 12 months and the set purpose of makers to sell only to Jan. 1 unless at an advance for the second six months. While no considerable tonnage has been contracted, some smaller makers have bought for their requirements until Jan. 1 at 1.33c, Chicago mill, and a still smaller tonnage has been bought by other small makers to July 1 of next year at 1.38c, Chicago, over the final six months. However, not sufficient of this business has been booked to make it a real indication of future prices. For immediate delivery steel bars are still quotable at 1.28c to 1.33c, Chicago.

Iron Bars Are Lower

Considerable weakness has been developed in the bar iron market in Chicago and rumors of unusually low prices are current. Quotations on bars apparently are fairly represented at 1.05c to 1.10c, Chicago mill. One large maker is keeping its mill busy on the basis of 1.07c, Chicago, but some tonnage is known to have gone at 1.05c, Chicago mill. In competitive territory isolated instances have come to light of tonnages being taken considerably lower than these quotations and some prices have been made which would figure back to the equivalent of 1.00c, Chicago, though this was for delivery at points where the freight rate makes competition successful. Rumors have appeared of small and attractive tonnages for immediate delivery at 0.95c, Chicago, but these are not verified.

The price of bars in eastern Pennsylvania continues firmer at 1.30c, Philadelphia, or 1.15c, Pittsburgh. Demand continues fair and specifications are being received in improved volume. The two inquiries noted last week still remain open. It is probable the one for 15,000 to 20,000 tons, from a Milton, Pa., buyer, will remain unclosed until August 1.

Eastern Pennsylvania bar iron mills continue to operate at 50 per cent of capacity or less. Common iron bars continue to be quoted at 1.15c to 1.20c, Philadelphia.

Hoops, Bands and Cotton Ties

The cotton price for 1914 has not been announced, although it is probable that leading manufacturers will adopt quotations within the next fortnight. Ties are being shipped to southern warehouses, and, despite numerous reports to the contrary, leading makers do not appear alarmed over the possibility of foreign competition. Bands are selling at a range from 1.10c to 1.15c; hoops are nominally listed at 1.25c.

Foundry Coke Buying

Casting Manufacturers Are Placing Contracts For Last Half Delivery

Foundries in the Cleveland district continue to place contracts for their requirements through the last half of the year on the basis of $2.50, Connellsville ovens. This price obtains in some instances throughout the ensuing 12 months, although one large producer refuses to quote on this basis beyond Jan. 1.

Standard Connellsville Sells at $2.00

One of the prominent shippers of Connellsville furnace coke has been awarded two contracts involving 18,000 tons a month over the last half of the year. Part of the fuel involved will be shipped west, and the remainder to an eastern consumer. Inasmuch as the entire tonnage was sold at $2, ovens, it appears as if the market were stronger than many believed, and there is said to be a greater disposition on the part of some buyers to insist upon fuel of the highest quality. Some contract furnace coke continues to be obtained at $1.85, ovens. The foundry market is unchanged, with leading sellers asking $2.50, ovens, for future delivery. The *Connellsville Courier* for the week ending June 13, says production was 259,615 tons, an increase of 16,006 tons compared with the week before.

Foundry Grades Selling

Contracting for foundry coke has been fairly heavy during the past two weeks. Dealers believe that about 40 per cent of the foundries in this territory have contracted for next year's requirements. Very little furnace coke is being sold as furnaces are buying small lots only, because spot shipment coke can be had much cheaper than that for contract.

A sale of 3,000 tons of coke was made by a St. Louis agent to an aluminum company in East St. Louis, which is about the biggest coke deal that has taken place locally for several weeks. Connellsville 72-hour coke is quoted at $2.50 to $2.75, and 48-hour grades at $2 to $2.25.

The Morris & Somerset Electric Co., Morristown, N. J., has ordered a steam turbine, direct connected with a 1,500-kilowatt generator; also a water tube boiler of 520 horsepower capacity.

(*For complete prices see page* 1148)

Scrap Market is Quiet

Railroads Place Embargo on Southern Ohio Mills

An embargo has been declared on shipments to the American Rolling Mill Co., Middletown, O. Other large users of old material are asking that shipments be withheld and the market probably will be very dull during the next 30 days. Demand is already at a minimum and shipments on old contracts are light. Many consumers have found that tonnages purchased for first half requirements will last through the last half as they have been running far below capacities. This is especially true of local jobbing foundries. Dealers are finding hope in the fact that quotations are still above the decline of several years ago, when heavy melting scrap was sold at slightly below today's figures of from $9 to $9.50 per gross ton.

Scrap Holds Its Level

No change in the scrap market in Chicago has taken place in the past week, prices remaining nominally at the same level and transactions being almost nothing. One large mill has bought some tonnage recently to fill its reserve, believing prices make it wise to take on such tonnage as can be carried conveniently. Brokers are willing to sell from their large accumulations but are not pushing their goods for fear of depressing prices further. Railroads continue to come into the market with fair tonnages and at present the following are before the market. The Chicago, Burlington & Quincy, 2,100 tons; Grand Trunk, 1,200 tons; Rock Island, 2,000 tons and the Chicago, Milwaukee & St. Paul, 2,000 tons.

Scrap dealers in the St. Louis district are waiting for the decision by the Interstate Commerce Commission, and meanwhile business practically is stagnant. Prices are unchanged from last week. No important lists have been issued.

The Cleveland scrap market is dull. Consumers are not buying for future needs, and seem well supplied for present requirements. Speculation also is about at a minimum among dealers. A revival may follow the mid-year inventory on July 1. Stocks of melting scrap are large. Foundry and rolling mill business continues extremely quiet. The Brier Hill Steel Co., Youngstown, O., has stopped shipments of old material, cutting off one big outlet for scrap in this district.

Old Materials Dull at Pittsburgh

The iron and steel scrap market in the Pittsburgh district is quieter than it was a few weeks ago, and quotations for all grades are considered nominal. Dealers say conditions do not look so bright as they did June 1.

Lull at Buffalo

Dealers in the Buffalo district report few sales and light inquiry. The principal local consumer has taken some heavy melting steel. Since early in the month the New York Central has sold over 400 tons of old iron axles, but aside from these the market is practically devoid of interest.

Consumers in eastern Pennsylvania and western New Jersey are showing somewhat more interest in prices on old materials but are not buying, except very sparingly. The only transactions reported are small sales of heavy melting steel at $10.75, delivered, and machine shop turnings at $7.75, delivered. Dealers are shipping vigorously material included under old contracts, which is not taken as indicative of strength. Dealers do not show any disposition to accumulate stocks, buying only to cover sales already made. Prices generally are unchanged from last week, but the market is largely nominal.

In New York, with the exception of scattered buying of machine shop turnings and cast borings to the Bethlehem Steel Co. and a few other consumers, the old material market has been very quiet. There is no trading in heavy melting steel, and, outside of turnings and borings, prices largely are nominal.

Warehouse Business Active

Steel warehousemen in Chicago find business much more active than earlier in the year. The principal demand is for structural steel and buyers are a unit in demanding almost immediate delivery. Prices remain the same as have been ruling except that No. 10 blue annealed sheets have been reduced $2 per ton and are now quoted at 1.85c, Chicago warehouse.

Decline in Warehouse Sheets

Two of the larger local warehouses have reduced the price of blue annealed sheets No. 10 gage, from 2.05c to 1.95c, but this figure has been quoted by smaller houses here for several weeks. Reductions on other materials have been checked, temporarily at least, because of the present outlook for better business. Demand is not as good as it was the first of the month, but the lull is thought to be temporary. Building operations are beginning to feel the efforts of the carpenters' strike in this city which has been in progress for about seven weeks, and which is causing builders to withhold shipments on building materials

Warehouse business in the Cleveland district continues fairly active, and users in almost every instance are demanding immediate shipment. This indicates that stocks are unusually low and reflects a continued disinclination on the part of consumers to buy for future requirements.

(*For complete prices see page* 1148)

Pipe Prices

Are Unchanged—Line pipe in Good Demand

In New York the cast iron pipe market displays a better feeling and both public lettings and private business are more plentiful. Among the important lettings of the week is one by the Metropolitan Water & Service Board of Boston, 2,100 tons, to the Warren Foundry & Machine Co. This involves all sizes from 8 to 24-inch, principally 24-inch, and went at a price of $20.90 per ton. This company also booked 1,250 tons for Albany, which went at an average price of $21 per ton. This tonnage included some 6 to 12-inch, but involved mostly 20-inch. The largest business now pending is that for the Isthmian Canal Commission. Bids are being received until July 6 on 2,100 feet of 24-inch, 40,000 feet of 30-inch and 20,00 feet of 36-inch cast iron pipe. The city of Winnipeg will open bids June 30 for 3,000 feet of 12-inch and 3,000 feet of 14-inch pipe. Milltown, N. J., is expected to award shortly 500 tons of cast iron pipe and 300 tons of sewer pipe. The water pipe includes all sizes, while the sewer pipe is 12-inch. Among the smaller inquiries is one for 200 tons of 6-inch and 500 tons of 12-inch, for Belleville, N. J., bids to be opened June 30.

Booth & Flynn Award Segments

Booth & Flynn, Ltd., Pittsburgh, general contractors, have divided the contract for 75,000 tons of cast iron segments for East river tubes between the Wheeling Mold & Foundry Co., Wheeling, W. Va., and the New York Car Wheel Co., Buffalo.

Cast Iron Pipe Slow

Dealings in cast iron pipe in Chicago are comparatively infrequent. Were it not for routine business and contractors' orders the market would be flat.

The United States Cast Iron Pipe & Foundry Co. has taken 1,700 tons of cast iron pipe for the Highland Park, Mich., line, the remainder to be of concrete and steel construction. This concern has also taken 350 tons at Nickerson, Kans. J. B. Clow & Son have been awarded 150 tons at Holland, Mich. Lewistown, Montana, for financial reasons, has decided to use steel pipe instead of cast iron pipe for its municipal improvement. Great Falls, Mont., opens bids this week for its year's requirements, from 120 to 300 tons.

Nuts, Bolts and Rivets

The market for nuts, bolts and rivets in the Greater Pittsburgh district offers little or nothing of interest. Prices are low and irregular, and plants are operating on reduced schedules.

Rivets Still Lower

With capacity in the Chicago district much in excess of the demand for rivets and elements of competition unfavorable, the market for rivets is lower than has been ruling recently. Structural rivets are going at 1.68c, Chicago, and boiler rivets at 1.78c, Chicago.

Tin Plate Unchanged

Tin plate mills in the Greater Pittsburgh district continue to operate at practically full capacity, and indications are that present schedules will be maintained until autumn. The 3.30c figure is being shaded when attractive tonnages for prompt delivery are involved.

Obituaries

Jacob C. Sotter, president of the Sotter Bros. Iron Works, Pottstown, Pa., died in that city June 20, at the age of 57 years. He was the inventor of many boiler appliances and was a director of the National Iron Bank, Pottstown, and other corporations.

Thomas H. White, for many years a prominent manufacturer of sewing machines and automobiles, died at his home in Cleveland, June 22, aged 78 years. Shortly after the civil war, Mr. White began making sewing machines at Orange, Mass., later moving to Cleveland, where in 1876 he organized the White Sewing Machine Co. In 1894 he began manufacturing bicycles also, this branch being later organized as the White Co., and enlarged to include the manufacture of automobiles. Mr. White had been in active charge of these companies until a few weeks before his death, when ill health forced him to give up active work.

Structural Steel Quiet

Although Contracts Placed Are Numerous, The Tonnages Involved Are Small

In the New York market, structural lettings during the week have totaled less than 5,000 tons, thus reflecting the shrinkage in volume which has characterized the past two months. New inquiries for fabricated material are scarce and are less in volume than at any time since last January. Eastern Pennsylvania shape makers report a slightly improved demand. This, however, does not involve any important tonnages, but is restricted to lots of less than 100 tons in size. Prices are firm at 1.26c, New York, or 1.10c, Pittsburgh.

Demand for shapes in eastern Pennsylvania has improved but continues of the small-order variety. The largest orders booked last week were 40 and 50 tons. The price is firm at 1.25 to 1.30c, Philadelphia, or 1.10 to 1.15c, Pittsburgh, and sellers are unwilling to contract. Structural tonnages in and near Philadelphia are few and there is very little demand from boat and locomotive builders.

Hotel Contracts Placed at Pittsburgh

The general contract for the new William Penn Hotel, Pittsburgh, has been awarded J. L. Stuart, that city. The American Bridge Co. will furnish the steel involved, 7,000 tons. Several other projects have been undertaken at Pittsburgh. Shapes are being held at 1.15c for future shipment, but tonnage has gone at 1.10c for spot delivery.

Fabricators in the Buffalo territory are becoming active with a number of small jobs, aggregating a considerable tonnage. All are more optimistic than they were a few weeks ago.

Bids have been received by Corrigan, McKinney & Co., Cleveland, for 3,500 tons of plates and shapes to be used in the erection of two blast furnaces, which will constitute a part of their new iron and steel plant, now being built. The contract for the steel for the William Bingham warehouse, which provides for 1,600 tons of shapes and 2,100 tons of bars, has not been let, and it is doubtful if an award will be made shortly, owing to the fact that the specifications are being revised. The new specifications probably will call for Bethlehem shapes. The tonnage involved includes 2,100 tons of bars and 1,600 tons of shapes. It is probable that the contract for the steel for the new shops of the Cleveland Railway Co., involving 1,500 tons, will be placed this week by the general contractor, W. I. Thompson.

(*For complete prices see page* 1148)

No Change in Structurals

Structural shapes in the Chicago market remain unchanged at 1.28c to 1.33c, Chicago, though in some instances stock shapes have been contracted at 1.25c, Chicago.

Awards for the week include one project of 1,220 tons in Chicago proper and others are for 500 tons or less, the west as usual participating more strongly than the Mississippi valley.

CONTRACTS AWARDED.

Miscellaneous plates for caissons, Panama Canal, 2,400 tons, United States Steel Products Co. low bidder.

William Penn hotel, Pittsburgh. General contract awarded James L. Stuart. Steel contract, 7,000 tons, awarded American Bridge Co.

Laundry addition to Fort Pitt hotel, Pittsburgh, 700 tons, awarded American Bridge Co. by James L. Stuart, general contractor.

Addition to Gazette-Times building, Pittsburgh, 1,400 tons, awarded American Bridge Co.

To George Kellogg Structural Co., Buffalo, for Sattler Theater, Buffalo, 100 tons steel.

To Riverside Bridge Co., Wheeling, W. Va., for King Sewing Machine Co.'s plant addition, 200 tons, structural steel.

To Buffalo Structural Steel Co., Buffalo, for Pratt & Letchworth Co.'s annealing shop addition, Buffalo, 100 tons steel.

To Pittsburgh Bridge & Iron Co., for new Roman Catholic church, Buffalo, 120 tons structural steel.

To Lupfer & Remick, Buffalo, general contract, highway lift bridge, Mount Vernon, N. Y., for Westchester county, 125 tons structural steel.

Station for New York, New Haven & Hartford railroad at Pawtucket, R. I., 400 tons, awarded Levering & Gerrigues.

Connecting loop at Forty-second street, New York City, for subway extensions, 500 to 600 tons, awarded Lackawanna Bridge Co.

United Illuminating Co., New Haven, Conn., 400 tons, to Berlin Construction Co.

Baltimore & Ohio railroad bridge, 150 tons, to the Mount Vernon Bridge Co.

Loft building at 784 Sixth avenue, New York City, 450 tons, to Milliken Bros.

Pennsylvania railroad bridge, Baltimore, 250 tons to the McClintic-Marshall Construction Co.

Adler loft, 35 West Thirty-fifth street, 550 tons, to Milliken Bros.

City and County building, Wilmington, Del., 1,500 tons, to the Belmont Iron Works.

Exposition building, Portland, Me., 500 tons, to eastern Bridge & Structural Co., Worcester.

Pier shed at Hoboken, N. J., for Hoboken Land & Improvement Co., 800 to 900 tons, to McClintic-Marshall Construction Co.

W. N. Kratzer & Co., Pittsburgh, manufacturers of structural steel and iron work, recently received the following contracts:

Approximately 325 tons of fabricated structural steel for eight buildings, administration, bakery, and six cottage buildings and addi-

tions to the Feeble Minded Institute building, Polk, Pa.

Fabricated steel work for three sub-stations for the Crystal Block & Coal Co.

New York State Barge canal, 356 checkered recess covers composed of steel angles and checkered plates.

The fabricated and structural steel work for Neville township school.

Steel work for service bridge, Dam No. 15, Ohio river, for the United States government.

Fabricated steel work for Sacred church, Braddock, Pa.

Fabricated steel, also doors and windows for two leantos for the Mercer Planished Steel Co., Mercer, Pa.

Garage and stable building for Uniondale cemetery.

Addition to furnace mill building of West Leechburg Steel Co., West Leechburg, Pa.

Approximately 400 tons of steel for the I. O. O. F. Temple, Oil City, Pa.

Structural steel for mine supports, etc., for the Lehigh-Wilkesbarre Coal Co., Wilkesbarre, Pa.

Chicago & North-Western Railroad Co., bridge over the Chicago river, near Deering station, 1,220 tons, to the American Bridge Co.

Great Falls Power Co., Great Falls, Mont., power house, Volta, Mont., 546 tons.

Yuba County, Cal., one 100-foot highway bridge on State highway, 500 tons.

City of Canon City, Col., viaduct 740 feet long, Canon City, Col., 300 tons.

Inter-Mountain Railway Co., girder spans over Boise river, Boise, Ida., 356 tons, to American Bridge Co.

Court House, Ashland, Wis., 215 tons to the Milwaukee Structural Steel Co.

STEEL CONTRACTS PENDING.

Highway bridge, Lucerne, Pa., 1,000 tons. Bids to be received Aug. 1.

Steel flooring for viaduct over New river in Virginia, for Virginian railway, 500 tons. Bids taken.

Commonwealth pier, Boston, 2,200 tons, Woodbury & Leighton, Boston, low on general contract, but award may not be made at this time because of pending law to replace present port commissioners with a new board.

Addition to plant of Pennsylvania Sugar Refining Co., Philadelphia, bids taken June 22, on revised tonnage, 800 tons.

Highway bridge over Susquehanna river at Nanticoke, Pa., 900 tons, bids in June 26.

United States Immigration Station, Boston, 600 to 700 tons. Bids in June 30.

Increases Order

More Cars—Track Supplies Active

The recent order of the Illinois Central Railroad carrying 3,000 cars has been increased to 5,000 cars, the additional 2,000 being divided equally between the American Car & Foundry Co., Haskell & Barker, Standard Steel Car Co. and the Pressed Steel Car Co.

Frisco System Buys

The Tennessee Coal, Iron & Railroad Co. has been awarded a contract by the Frisco System for 32,000 tons of rails which will be shipped during the next few months.

The Roanoke Bridge Co., Roanoke, Va., capitalized at $250,000, was placed in receiver's hands on June 19, J. H. Schoenley, of Roanoke, being named as receiver. The plant employs several hundred men. No statement of liabilities or assets has been made.

Late Car Orders

The Illinios Central reported in market for 30,000 steel underframes

New York, June 24. (By wire.)—The Wabash railroad is inquiring for 1,000 box cars, 500 underframes and seven mail cars. The Toledo & Ohio Central is in the market for 1,000 box cars and 1,000 gondolas. The Seaboard Air Line has placed a contract for 440 box cars and 45 passenger cars. The American Locomotive Co. has taken 30 locomotives. The Lackawanna railroad requirements probably will be placed early in July, but an inquiry is now out for 200 mine and 55 suburban cars. The Illinois Central railroad is reported negotiating for 30,000 steel underframes.

Pig Iron Active at Pittsburgh

Pittsburgh, June 24. (By wire.)—Tentative negotiations for pig iron in this district involve about 3,500 tons of Bessemer and about 10,000 tons of foundry, including from between 4,000 to 5,000 tons for the Standard Sanitary Mfg. Co., which probably will buy more extensively than first expected. One of the steel plants in this immediate district is figuring on 3,000 tons of Bessemer for the remainder of the year and another for 500 tons. The last sale of Bessemer in this district was closed on the basis of $14.90, delivered. Scattering inquiries for foundry grades include about 7,000 tons, No. 2 foundry selling at a range from $13.90 to $14.40, delivered.

Chapman Producers Ordered

The Pittsburgh Plate Glass Co. has placed an order for five 10-foot rotary gas producers with The Chapman Engineering Co., Mt. Vernon, O. This is the second installation of Chapman producers made by The Pittsburgh Plate Glass Co. The Chapman company also announces the receipt of orders for producers from the American Clay Co., Terre Haute, Ind., and the American Bottle Co., Newark, O.

(*For complete prices see page* 1148)

METAL MARKETS

New York

June 23.

Copper.—Weakness continues to be reflected in the refined copper market and first hands generally are willing to sell at 13.75c, delivered 30 days, although the regular asking price remains somewhat higher. Lower prices are bringing out business, both from domestic and foreign consumers, but buying continues to lack volume and there continues a tendency to close only for immediate requirements. On a wholesale contract basis, electrolytic now may be quoted at 13.55c to 13.65c, cash, New York, and prime casting at 13.50c to 13.55c cash. Prime lake may be quoted at 13.87½c to 14c cash.

Tin.—A scarcity of spot tin, which has existed in Manhattan the last two weeks, was relieved today by the arrival of the Minneapolis, with 870 tons of tin aboard. The premium which has been asked on Manhattan delivery because of lighterage charges, therefore has disappeared. Spot is held at 30.75c, which price applies to June and July. Each succeeding month is held ½c higher. Very little business is reported from consumers generally.

Spelter.—Demand continues of very meagre proportions and the undertone reflects a slight weakness. The market may be quoted at 5c to 5.05c, New York.

Lead.—This market is dull and few inquiries of importance are reported. The price continues firm at 3.90c, New York. Demand from abroad is still good.

Antimony.—There continues a total lack of demand for this metal and prices continue weak in tone. We quote, on large lots, duty paid, New York, as follows: Cookson's 7.-12½c to 7.25c; Hallett's, 6.80c to 6.90c; other brands, 5.65c to 5.75c. These prices probably could be shaded.

Chicago

June 23.

Comparatively small business is being done in non-ferrous metals in this market and prices are unchanged except in slight degree following quotations in primary markets.

We quote dealers' selling prices f. o. b., Chicago, as follows:

Lake copper, carload lots, 13.75c; casting, 14.00c; smaller lots, ¼c to ¾c higher. Spelter, car lots, 5.00c; lead, desilverized, 3.80c; sheet zinc, $7.00, f. o. b. La Salle, in car lots of 600-pound casks; pig tin, 31.25c; Cookson's antimony, 7.25c; other grades, 5.75c.

Dullness continues to characterize the market in old metals and so little trading is being done that prices are difficult to arrive at. Quotations are nominal with the probability purchases may be made at somewhat lower levels if the tonnage should be attractive.

We quote dealers' selling prices f. o. b., Chicago, as follows:

Copper wire, crucible shapes, 12.75c; copper bottoms, 11.50c; heavy red brass, 11.75c; heavy yellow brass, 9.00c; No. 1 red brass borings, 10.50c; No. 1 yellow brass borings, 8.00c; brass clippings, 9.25c; lead pipe, 3.60c; zinc scrap, 4.00c; tea lead, 3.50c; No. 1 aluminum, 14.00c; No. 1 pewter, 22.50c; block tin pipe, 30.50c; tin foil, 27.00c; linotype dross, 3c; electrotype dross, 3c; stereotype plates, 4.25c; stereotype dross, 3c.

According to an announcement made at Charleston, W. Va., the Becker Steel Co., of Germany, has obtained control of the Baldwin Steel Co., at that place. The plant has been idle several years.

MEN OF THE IRON TRADE

Who they are Where they are What they are doing

At the recent annual stockholders' meeting of Hickman, Williams & Co., H. L. Williams was elected president to succeed R. B. Hickman. The latter was elected vice president and director. No other changes were made among the officers or directors. F. M. Eaton will retire from active management of the Cincinnati office on account of ill health. He retains his interest in the business and remains on the board of directors. E. P. Hettiger, who has been in charge of the Cincinnati office during the absence of Mr. Eaton, will succeed him

EDWARD P. HETTIGER

permanently. John O. Henshaw retired June 1 from the management of the Philadelphia office, and will be succeeded by Coleman Ward, whose headquarters will remain in Pittsburgh. Mr. Henshaw will take over the Boston office of Hickman, Williams & Co, for his personal account, effective Aug. 1, 1914.

Edward P. Hettiger, who succeeds Frank M. Eaton as resident manager of the Cincinnati office of Hickman, Williams & Co., has been connected with that firm for 21 years. Mr. Hettiger was born in Louisville, Ky., in 1875, and began his business career with George H. Hull & Co., of that city. He went with Hickman, Williams & Co. shortly after its organization and remained in the Louisville office until 1900. From there he was transferred to the Chicago office, remaining there until last year, when he came to the Cincinnati office to take charge during the absence of Mr. Eaton, who was away because of ill health.

Frank M. Eaton, who has been resident partner and manager of the Cincinnati office of Hickman, Williams & Co., since 1903, has retired because of his health, but retains his interest in the business and remains on the board of directors. Mr. Eaton has spent the larger part of his business career in prominent positions in the pig iron trade. He was secretary-treasurer of the Woodward Iron Co., Birmingham, Ala., from 1893 to 1898, when he went to the Virginia Iron, Coal & Coke Co., of Roanoke, Va., as general sales manager. He then entered the firm of Hickman, Williams & Co., coming to Cincinnati in 1903 as resident partner.

A. L. Nash, of Crocker Bros., New York City, sailed for Europe June 20. Mr. Nash expects to be gone until about Aug. 1.

A. T. Hazen, Cincinnati, has been appointed representative in that city of the Chicago Ornamental Iron Co., Riverside Bridge Co. and the Sykes Co., all of Chicago. He has established an office at 404 Johnston building.

C. L. W. Trinks, professor of mechanical engineering, Carnegie Institute of Technology, Pittsburgh, read an interesting paper on "Air in Jet Condensers" on June 16, before members of the Engineers' Society of Western Pennsylvania, Pittsburgh.

J. C. West, hitherto local manager at San Francisco of the Sullivan Machinery Co., Chicago, has been transferred to the general offices at Chicago as general sales engineer. Ray McGrath, of the New England sales office at Boston, has been appointed district manager at San Francisco.

Wm. A. Bole has been elected vice president in charge of production and erection for the plants at East Pittsburgh and at Trafford, of the Westinghouse Machine Co. Mr. Bole has been in the continuous employ of the company since August, 1882, having successively filled the positions of general shop foreman, superintendent, manager of works and consulting engineer.

F. E. Pierce has terminated his connection with the New Jersey Zinc Co., in whose employ he served for over 15 years, in various capacities, for the latter part as chief engineer, and has opened an office to engage in consulting work in civil and metallurgical engineering at 35 Nassau street, New York City. Mr. Pierce is a graduate of the Columbia University School of Mines.

J. G. Rohrman, recently placed in charge of a new office established at Atlanta, Ga., by the Youngstown Sheet & Tube Co., Youngstown, has

FRANK M. EATON

been succeeded in the Pittsburgh district by D. V. Sawhill. Mr. Rohrman will have charge of a territory covering Georgia, Florida, Alabama, North Carolina, South Carolina and eastern Tennessee, and Mr. Sawhill will travel from the Pittsburgh office, which is in charge of E. S. Rooney.

W. H. Donner and Geo. V. Massey were elected directors of the Cambria Iron Co., succeeding Geo. F. Baer, deceased, and E. T. Stotesbury, resigned, at a meeting in Philadelphia, June 18. Alexander P. Robinson, formally was made treasurer to succeed E. T. Stuart, who resigned some time ago to become treasurer of the Pennsylvania Steel Co. The directors' meetings of the company will be held on the Tuesday before the fourth Friday of each month.

Pig Iron Losses

Merchant Blast Furnace Operations Show No Profits and Output is Curtailed

At a meeting of the Cleveland district members of the American Pig Iron Association, held at Youngstown, O., Tuesday, June 23, Secretary John A. Penton presented a report, briefly reviewing the condition of the merchant blast furnace industry of the United States, during the months of January, February and March. The total theoretical capacity of the furnaces operated by the members of this organization during this period was 2,929,800 tons, yet owing to the condition of business and the consequent closing down of a very large number of stacks, the production during this period was only 1,097,187 tons.

The report continues, in part, as follows:

"The total number of workable furnaces belonging to the members of the Association north of the Ohio River is 110, and the average number in operation per month during these months was 65—the average number idle having been 45.

"The total cost of production varies somewhat in the different districts and, therefore, it is perhaps only fair to use the data and estimates made by the government and referred to in the report of your secretary at the general meeting held in April in New York City.

"The government places the average bare furnace cost of all grades in the territory north of the Ohio river at $14.16 per ton, in a report presented by Secretary Redfield to President Woodrow Wilson, as shown by his report, page 87 and pages 541 to 566, inclusive.

"Taking that figure as a basis, the total loss on all sales of iron made by our members during January, February and March, amounted to $1,883,964.94. In the same way it is easily determined that the difference between the average price per ton of shipments and the government's estimate of costs for those months, amounted to $1,235,517.18.

"The total difference between the exact average price of the unfilled orders upon the books of all our members and the government's figures of cost, on the unfilled orders upon the books of our members April 1, 1914, amount to $1,539,071.82.

"These figures could be carried further and could be made to show the loss on the books from stocks on hand, valuing these stocks at the present market price, but it is unnecessary to make a more discouraging statement. Unsatisfactory as the conditions were during the first quarter, they have shown no improvement in April, May and June."

Close Mills July 1

No Agreement on Sheet and Tin Plate Scale—Independent Mills Affected

The Atlantic City conference between officers of the Amalgamated Association of Iron, Steel and Tin Workers and manufacturers of sheets and tin plates employing members of that organization, adjourned Saturday without accomplishing anything definite toward adopting a wage scale for the year beginning July 1. This means, in all probability, that the 18 plants controlled by the Amalgamated Association will shut down June 30, unless the proposed wage scale is signed before that time. There is no "continuous operation" agreement with sheet and tin plate mills.

Advances are not considered heavy, but it is apparent that mill owners do not feel they can increase wages under present market conditions. Both sheets and tin plates are selling at comparatively low figures, and it is not believed by many that quotations will strengthen for at least some time. Plants employing men identified with the Amalgamated Association, and the number of mills owned by each interest, follow:

Sheet: American Rolling Mill Co., Middletown, O., 21 mills; Brier Hill Steel Co., Youngstown, O., 20 mills; Canton Sheet Steel Co., Canton, O., 7 mills; Deforest Sheet & Tin Plate Co., Niles, O., 10 mills; Follansbee Bros., Follansbee, W. Va., four mills; National Enameling & Stamping Co., St. Louis, 14 mills; Newport Rolling Mill Co., Newport, Ky., 10 mills; Trumbull Steel Co., Warren, O., 10 mills; Whitaker-Glessner Co., Wheeling, W. Va., 15 mills.

Tin: Carnahan Tin Plate & Sheet Co., Canton, O., 7 mills; Follansbee Bros., Follansbee, W. Va., 6 mills; Griffiths Charcoal Iron Mills, Washington, Pa., 2 mills; National Enameling & Stamping Co., St. Louis, 10 mills; Trumbull Steel Co., Warren, O., 6 mills; N. & G. Taylor Co., Cumberland, Md., 8 mills; Washington Tin Plate Co., Washington, Pa., 6 mills; Whitaker-Glessner Co., Wheeling, W. Va., 5 mills.

Out of the total number of 29 independent sheet mill interests, the Amalgamated Association is represented in nine of the concerns. Of the 15 independent tin plate interests, the association controls eight mills, and claims also the Steubenville plant of the Phillips Sheet & Tin Plate Co.

Iron Mines Close

Big Stevenson Pit Ceases Operation—June Ore Shipments Decline

It is generally admitted that the present season is the most backward that the lakes have experienced since the ore trade became the dominant trade of the lakes. The movement of ore to June 1 was less than 50 per cent of the corresponding movement last year, or to be exact, 4,121,749 tons, as against 8,150,599 tons in 1913. While the June movement is somewhat better than the May movement it is not sufficiently so to lend much encouragement to the trade and it looks now as though the summer would idle itself away and throw the whole brunt of the business upon the fall months where it will have to encounter the heavy obstacles and serious delays that the elements inevitably incur.

There are practically no wild cargoes offering as shippers have about all that they can do to take care of their own vessels. Scores of vessels have not turned a wheel since the season opened while others that delivered their cargoes of storage coal have gone into ordinary after vainly knocking about the harbors for business. Others will go to dock at the end of the present month if business does not improve as they can save insurance charges by following this course.

Meanwhile the iron ore mines are closing down. Corrigan, McKinney & Co., of Cleveland, have added the Stevenson mine, one of the best producers on the Mesabi range, to their idle list. Oglebay, Norton & Co., of Cleveland, have ceased operations on the Bristol, Chatham and Berkshire mines on the Menominee range, Empire on the Marquette, Montreal on the Gogebic and Woodbridge on the Mesabi. Few of the mines are being worked to their normal output and it is predicted that the shipments from the great Mesabi range will show a falling off of from 12,000,000 to 15,000,000 tons from the movement of last year when 32,000,000 tons were shipped.

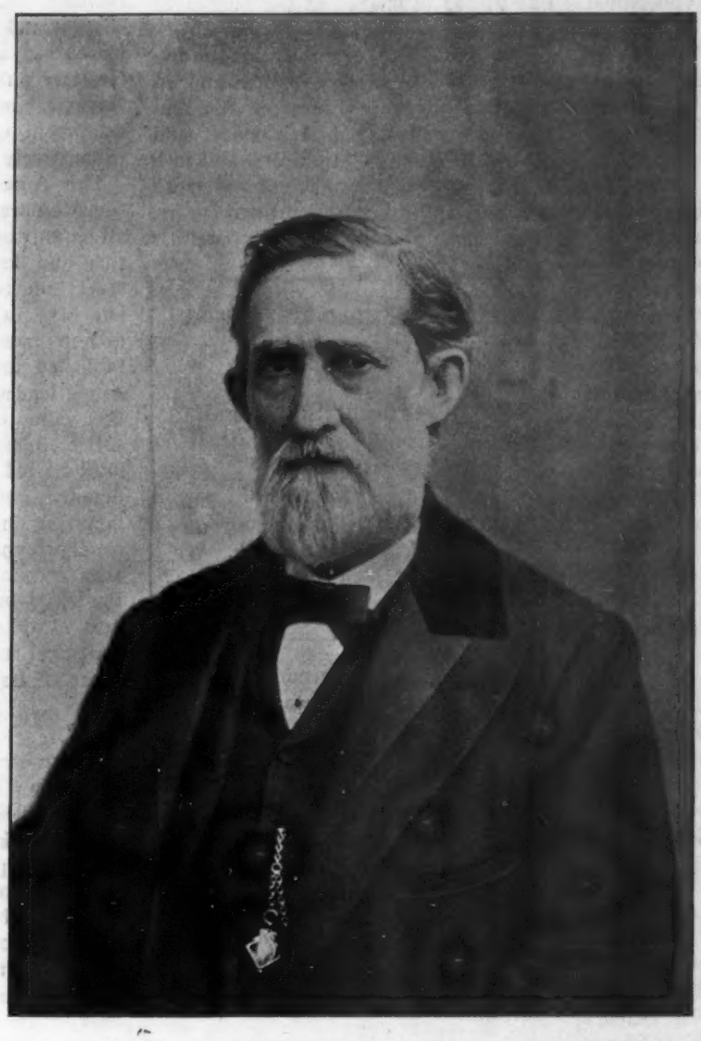
No attempt has been made to operate a number of mines on the ranges for the simple reason that they cannot be operated profitably at present prices even if a market existed for the product.

A large independent company reports that it has not sold a pound of ore to any furnace interest so far this year. Some sales of ore have been made, but they are mere fragments and would not be even mentioned in normal times.

Fifty Years of Loyal Service

A Survey of the Career of James M. Swank, Who Died in Philadelphia Sunday Night

BY THE DEATH of James M. Swank, which took place in Philadelphia on Sunday evening, June 21, there was brought to a close a career that has been intimately associated with the iron and steel industry in this country for half a century. During most of this period Mr. Swank was general manager of the American Iron and Steel Association, which for many years performed an invaluable service by the collection and publication of comprehensive statistics regarding the production of iron and steel products in the United States. Mr. Swank was taken ill several weeks ago, but after a short time his condition improved and careful nursing brought him back nearly to a normal state of health. Later, however, he suffered a relapse and the end followed quickly. Many years ago Mr. Swank married Anna P. Linton, who survives him. Her father was a prominent railroad contractor in western Pennsylvania and was at one time a member of the Pennsylvania legislature. Mrs. Swank is a granddaughter of U. S. Senator Abner Lacock, one of the first Senators from Pennsylvania. Mrs. Swank was born at Johnstown. In addition to his widow, Mr. Swank is survived by two sisters, Mrs. Emily M. Lee, of Johnstown, Pa., and Mrs. Mary M. Turner, of Wilkinsburg, Pa. Powell Stackhouse, president of the Cambria Iron Co., is a brother-in-law. Mrs. Swank is a sweet woman of strong personality. While not now in good health she has borne up bravely under the shock of Mr. Swank's death. She accompanied Mr. Swank's body to Johnstown, where interment was made on Wednesday. The funeral services were conducted at Johnstown and were held at the home of his sister, Mrs. Lee. Rev. Hayes, of the Presbyterian church, officiated. Mr. Swank had special qualifications for his life work. He was born in Westmoreland county, Pa., July 12, 1832, and in his youth was constantly in contact with the iron industry of western Pennsylvania. His home was at Johnstown, a prominent iron center, where he received a common school and academic education. He chose journalism as a profession, and in 1852 took charge of the local Whig newspaper. In 1853 he founded the *Johnstown Tribune*. Having inherited a liking for public affairs, and being familiar with the country's tariff legislation, he soon became a strong advocate of the policy of protection to home industry. He was personally familiar with the disastrous effects upon our iron industry of a purely revenue policy, from 1846 to 1861.



JAMES M. SWANK—HISTORIAN AND STATESMAN

Parting with the *Tribune* in December, 1869, Mr. Swank passed the next three years in Washington, first as clerk of the committee on manufactures of the House of Representatives and afterward as chief clerk of the Department of Agriculture. While holding the latter position, he prepared a history of the department. In December, 1872, he resigned the last named position to take charge of the work of the American Iron and Steel Association. This organization was the successor to the American Iron Association, which was formed in Philadelphia on March 6, 1855, and its office was established in that city. A vast amount of valuable information relating to the iron industry of the whole country was compiled and published in the bulletin of the parent association from 1855 to 1859, the first bulletin appearing early in 1856. In 1859, the association published "The Iron Manufacturers' Guide to the Iron Works and Iron Ore Mines of the United States," compiled by the secretary, Prof. J. P. Lesley. It contained about 800 printed pages and several excellent maps. On Nov. 16, 1864, the association, which had been in a dormant state owing to the Civil war, was reorganized and its name changed to the American Iron and Steel Association, to meet the new conditions created by the advent of the age of steel. The office was continued at Philadelphia. The new association, with an average membership of over 300 manufacturing firms and companies was in active operation from that day until it was succeeded by the American Iron and Steel Institute, a period of 48 years, and during 40 years of that time, beginning with Jan. 1, 1873, Mr. Swank was its secretary and either officially or in fact its general man-

ager. When Mr. Swank entered the office of the association, he was confronted with a difficult task. One of the principal objects of the association, was the collection of statistics of the American iron trade. An immediate necessity was a complete list of the active iron and steel manufacturers of the country from which source alone could accurate statistics be obtained. The list compiled by Prof. Lesley before the war was out of date and later lists were incomplete.

In November, 1873, the first edition of the now well known "Directory of the Iron and Steel Works of the United States" was published. Seventeen editions and two supplements of the "Directory" have appeared. In the same month, the first "Annual Report" of the new secretary, containing statistics of production, was presented at the annual meeting of the association. The "Annual Report" thereafter appeared regularly. The "Directory" has described the iron and steel works of the country and the "Annual Report" has faithfully told what they have made.

The Bulletin of the old Iron Association, which first appeared in 1856, was published at irregular intervals, chiefly for statistical purposes. The American Iron and Steel Association continued the irregular publication of the Bulletin until Sept. 12, 1866, when the first number of a new series, to appear weekly, was issued. Mr. Swank found the weekly Bulletin in existence when he assumed charge of the office. The paper was, however, enlarged after he became its editor. Its principal characteristics under his management, were the presentation of statistical information additional to that contained in the "Annual Report" and the discussion of tariff and other questions of interest to the American iron trade. In its later years, the Bulletin was published semimonthly. It was discontinued when the work of the association was assumed by the Institute, Jan. 1, 1913.

Mr. Swank remained in full charge of the Association's work for 12 years longer than he desired. In January, 1909, at the end of 36 years of service as executive head of the association, first as secretary, then as general manager and during the preceeding 22 years as secretary and general manager, he asked that his successor be elected, but no action was taken. No way of carrying on the work of the association without Mr. Swank seemed to be satisfactory until the American Iron and Steel Institute was organized. In due time the officers of the Institute indicated their willingness to take up and continue the work of the association after the close of the year 1912, and a special committee of the board of directors called by invitation upon Mr. Swank at his office in Philadelphia on Monday, December 9, 1912, to personally inquire into the details of the work of the association and to arrange for its continuation.

As a result of this conference, the work of the association was taken over by the Institute. It was decided to continue the statistical work in Philadelphia in the old offices and William G. Gray, who for many years had been Mr. Swank's able assistant was placed in charge of the bureau of statistics.

The work of the association in behalf of the protective policy and in behalf of adequate duties on iron and steel always received the earnest and active attention of its officers, and into this work Mr. Swank entered with zeal and enthusiasm. For many years, the friends of protection in congress relied upon him for accurate information whenever a tariff was under consideration. In addition to the discussion of the tariff question, which he soon made a leading feature of the Bulletin, he presented in the "Annual Report" for 1876, a carefully prepared history of the industrial policies of Great Britain and the United States, and in 1877 he issued "Hold the Fort," the first of a series of tariff tracts of which many millions have been printed and gratuitously and systematically distributed.

Tribute From Carnegie

(*Cablegram*)

41 H. DA J 20
Dornoch, Sutherland,
July 20, 07.

IRON TRADE REVIEW,
Cleveland.

Iron and Steel owes an unpayable debt to Swank, we should raise fund for him.

Carnegie. 1:07 p. m.

Published Many Valuable Works

It was a labor of love for Mr. Swank to do what he could to preserve from oblivion the achievement of the pioneers in the manufacture of iron and steel in our country. In 1878, he published in book form an "Introduction to a History of Iron Making and Coal Mining in Pennsylvania." Having been selected by Gen. Francis A. Walker to collect the statistics of iron and steel for the census year 1880, he accompanied his final report in 1881, which contained these statistics, with an historical sketch of the manufacture of iron and steel in all countries and particularly in each state and territory which had been engaged in their production, the work of the colonial and other pioneers receiving special attention. The historical part of this report, with additions, was afterward published in book form. A second edition, greatly enlarged, appeared in 1891, both editions being entitled, "Iron in All Ages." The columns of the Bulletin also contained many contributions of a historical character.

In December, 1897, he published a souvenir volume of 228 pages, entitled "Notes and Comments on Industrial, Economic and Historical Subjects." He later published "Progressive Pennsylvania," in which the industrial development of the Keystone state was exhaustively reviewed.

The American Iron and Steel Association was an accepted authority in all countries upon the statistics, history and development of the iron and steel industries of the United States, but Mr. Swank brought to the association even a higher honor. He established for it the reputation of absolute leadership in teaching the world the value of accurate and promptly collected manufacturing statistics. Not until he led the way had accurate and detailed statistics of any great manufacturing industry at home or abroad been promptly collected from year to year by any agency whatever. The British Iron Trade Association was not established until 1875, and its statistical methods were modeled after those of its American prototype.

Mr. Swank's Personality

In an article on Mr. Swank published in THE IRON TRADE REVIEW, Jan. 2, 1908, B. F. Stephenson says: "Mr. Swank entered into this work of defense of protection with a zeal born of the conviction that one's cause is just. He had seen the iron industry of the whole country halt and wane because of the vacillating tariff politics of the times, and he had firm faith that it could be built up to an important position only by a schedule of duties sufficiently high to prevent ruinous competition from abroad and so steadily maintained as to give manufacturers the courage necessary for any industrial advance. From the first the friends of protection in congress relied upon him for accurate information. More than that, he represented the iron and steel manufacturers in every tariff campaign at Washington after he became secretary. Representing these interests meant that he vir-

tually managed their part of all tariff controversies involving congressional legislation; in short, he has been the politician of the association for 35 years, and in all that time the association has never lost a tariff battle.

"Turning to the personal side, Mr. Swank is the most genial of men. Above medium height, straight and spare of person, his appearance is commanding. His memory is a storehouse of historical facts. His love for books has built up the association's library from a modest collection of three volumes when he became secretary to a complete collection of works of reference and has lined the walls of his 'den' with a well chosen private library,—including many exceedingly rare volumes,—chiefly on historical subjects. About his 'den' walls are many framed autograph letters from notables, and the association offices contain a collection of interesting portraits.

"If Mr. Swank has hobbies, they are two—accuracy and good printing. Of the association publications he says: 'In all that we have printed, of whatever character, we have aimed to be first of all accurate. Our statistical statements always add, and we never say pounds when we mean tons.' And there is ample evidence that this striving for accuracy has been appreciated, for the government has relied upon the association to collect census statistics covering iron and steel production for the last three decades. This has naturally been a source of pride to Mr. Swank, but he has other reasons for gratification. To the writer he said recently: 'If there is anything that I am proud of in looking back over 35 years of continuous service in this office it is the good style of all our publications—the arrangement of the matter contained in them, their uniformity, and their neat typographical appearance'."

He Knew Many Prominent Men

Many times and especially after his retirement from his work in connection with the American Iron and Steel Association, Mr. Swank was urged to write his reminiscences of the eventful years through which he had lived. In private conversation, Mr. Swank would tell of how he heard Ralph Waldo Emerson, Horace Greeley, Bayard Taylor or Elder Agassiz and other eminent men of their day. He would tell of an interview he had with Abraham Lincoln; how he sat at the dinner table with Zachary Taylor, when he was President, and he talked most entertainingly of statesmen he had known. He remembered the Mexican war well and had many interesting reminiscences of the Civil war. He knew all about how various tariff bills beginning in 1870 were made. But Mr. Swank could never be induced to put his reminiscences in type.

Pacific Coast Suffers

Receipts of Foreign Steel Increase and Local Mills Are Idle

To the Editor:—

We have been close observers of the subject matter of the effect of the present tariff on the iron and steel market in your publications, and we wish to give you some facts and figures, as this affects and applies to conditions on the Pacific coast.

During the full twelve months prior to the date of the present tariff bill, there was imported into the Port of Seattle 826 tons consisting of bar iron, bar steel, angles and shapes, while during nine months' operation under the present tariff, the Port of Seattle alone has received 3,332 tons, consisting of the same classes of material.

Foreign steel is being sold at $1.30 to $1.35 per 100 pounds, duty paid, delivered on dock Seattle, while the lowest price which eastern mills have been able to make for delivery to Seattle, water shipment, is $1.65. The local mills on the Pacific coast located at Seattle, San Francisco and Los Angeles have been able to meet the eastern competition only, and have made their prices equal to the eastern prices, while they have not been able to do anything better, or anything toward offering competition which would prevent the purchase of these foreign bars.

The mills on the coast are operating less than 50 per cent of capacity, and as all of these plants are located on tidewater, where they have no protection in a rail haul after this foreign material is delivered to Pacific coast terminal points, they are hit much harder than industries on the Atlantic coast, which are situated some distance from tidewater, as on the Pacific coast nearly all of the local mills' products are consumed by the coast cities, as the territory inland from the coast is but sparsely settled and their requirements are very light.

Inasmuch as nearly all the product here is made very largely from scrap which accumulates locally, no raw material is required which is imported, and on which the duty has also been reduced, consequently, Pacific coast points, while being hit very hard by the present reduction in duty, receive no benefit from any cheaper raw materials.

The situation does not look encouraging to the manufacturer of iron and steel bars on the Pacific coast, and we are living now principally on hopes that the results of the operation of the present tariff will soon convince the proper authorities that operating less than half time, while we are watching the large liners unload steel at our door, does not offer much encouragement to our workmen for a full dinner pail.

As an example of the different attitude taken by our near neighbors in Canada, in Victoria and Vancouver, on whom we depend to take part of our product, within the past 90 days new improvements being made at these points required 6,300 tons reinforcing steel, principally in public improvements. Our product entering Canada is subject to a duty of $7 per ton, and not being content with this protection, the authorities at these points also had a clause attached to the specifications providing that nothing but Canadian steel would be used in this work.

We went there prepared to make a bid on this material, hoping on account of being able to make very quick deliveries we would be able to secure at least part of this business, but were prohibited from bidding on account of the clause mentioned.

We have no information yet as to how much lower the rates will be from Europe when the Panama canal is in operation, which would reduce the price of foreign bars still lower at our port, but we feel reasonably sure that the rates will be lower, consequently we cannot see any bright spots in the immediate future.

T. S. CLINGAN, *Manager.*

Pacific Coast Steel Co., Seattle.

Fairfield Operating

New Plant of the American Steel & Wire Co. Add to Wire Production

Shipments from the new Fairfield plant of the American Steel & Wire Co. near Birmingham, Ala., commenced on June 20. It is said that a considerable volume of business has been placed on the books of this plant and that in spite of the usual summer dullness, some large shipments will be made in the next few months. It is further stated that between now and September the force at the wire and rod mills will be increased until 2,000 men are employed.

The Fairfield plant is equipped to manufacture barb wire, woven wire fence, plain, annealed and galvanized wire, fence staples and standard wire nails. The machinery and equipment of the mill is modern in every particular. In addition to the products which are manufactured at Birmingham, it is the purpose of the American Steel & Wire Co. to carry a stock of wire rope, telegraph and telephone wires, electrical wires, etc., on hand for immediate shipment.

This mill is the nucleus of the town of Fairfield, built by the Steel Corporation in much the same manner as Gary, Ind., was constructed. Fairfield is already assuming the proportions of a manufacturing center. It is situated near the city limits of Birmingham, about half of it being inside the corporaton line.

Reports from Malone, N. Y., announce the discovery of large beds of zinc-bearing rock in the town of Edwards, in St. Lawrence county, N. Y. It is said that Philadelphia interests have control of the deposits.

Shrapnel Orders

Contract for 20,000 May be Placed With Private Plants

Washington, June 23. — Private plants are being given consideration for the manufacture of shrapnel for the navy. In view of this, the navy department, through Secretary Daniels, acting upon the recommendation of Rear Admiral Strauss, chief of the ordnance bureau, has withdrawn a previous order for the manufacture at the local navy yard of 20,000 three-inch shrapnels. At the same time, official assurance has been given that the force at the Washington yard will not be reduced.

It was pointed out that manufacture of the ordnance at the local yard was in the nature of an experiment, and, while the capabilities of the plant had been proven, there still was some question as to whether the work could not be done more cheaply by private plants. For many years the navy department has obtained its shrapnel from the Frankfort arsenal, near Philadelphia.

The local yard last April made 10 experimental shells, and, the work proving entirely satisfactory, an order for 10,000 shrapnels followed. That order was executed when another was given for a larger quantity. Then representations were made to the navy department by private makers that they could do the work much more cheaply than the government. Because of these claims Secretary Daniels recalled the order to the Washington yard for 20,000 shrapnels and directed that their manufacture be opened to general competition. If the private makers can do the work more cheaply the order will be given them, it is understood. If it is found, however, that the local navy yard can do the work as cheaply as private concerns, the plans for manufacture at the navy yard will be executed.

New Specifications

The Association of American Steel Manufacturers has recently published its revised specifications for structural and boiler steel, concrete reinforcing bars rolled from billets, and rail steel reinforcing bars. The revised specifications are issued in pamphlet form. The principal changes include narrowing the tensile range for fire box steel from 10,000 to 8,000 pounds and the insertion of new tables covering the permissible variations in gage and weight of sheared plates. These tables replace the tables which were adopted by the association in 1896 and which have since been widely copied into nearly all plate specifications. The present tables refer to individual plates rather than averages, and the sub-division as regards width is carried out in much more detail than in the old tables.

In the specifications for concrete reinforcing bars rolled from billets an intermediate grade of bars with a tensile strength of 70,000 to 80,000 pounds has been introduced, and in the specifications for rail steel concrete reinforcing bars slight changes have been made in Section V, covering the number of tests.

Will Build Pipe Plant

Benson Bros., Ltd., 51-53 Druitt street, Sydney, New South Wales, Australia, contemplate the erection of a cast iron pipe plant for the manufacture of pipe from 6 to 36 inches in diameter. This company would like to receive from American manufacturers printed matter describing clay mills, core-making machines, ramming devices, machines for cutting off ends of spigot and faucet pipe, as well as machines for turning the faces, edges and backs of flanges, cupolas, magnetic separators and other equipment for installation in a modern cast iron pipe plant.

Hearing Postponed

Indianapolis, Ind., June 22.—A hearing on the suspension of car spotting tariffs issued by the railways entering Muncie, Ind., and applying to the Muncie & Western railway, owned by Ball Brothers, glass manufacturers, has been postponed until some time within the next 30 days, when it will be held at Washington, D. C.

The Galion Iron Works & Mfg. Co., manufacturer of culvert pipe and road machinery, Galion, O., in reference to the reduction of the capital stock of the Galion Iron Works from $150,000 to $5,000, advises this was the name under which it operated until Jan. 1, 1914, when it reorganized into an entirely new corporation known as the Galion Iron Works & Mfg. Co. Since Jan. 1 it has operated under the new name and taken over all the assets of the old company; it also has made a considerable increase in capital stock. Recently it reduced the capital stock of the old corporation to a minimum sum which will be retired in due time.

The Erie railroad has placed its Hornell, N. Y., shops on full time again and until further notice the men will work from 55 to 60 hours a week.

Mine at the Panama-Pacific Exposition

At the request of various mine operators and the exposition officials, the United States Bureau of Mines has undertaken to construct, in cooperation with the mining industry and the manufacturers of mining machinery, a mine beneath the floor of the Palace of Mines and Metallurgy at the Panama-Pacific Exposition at San Francisco.

The financial and operative success of the mine is assured through exhibits promised as typical metal and coal mining operations will be reproduced by full-size working places in which mining machinery will be installed and operated. The walls of the mine will be covered with either ore or coal typical of the mine illustrated. Among others, the Jones & Laughlin Steel Co. has agreed to reproduce one of its working places or stopes and to contribute the sum necessary to the installation and operation.

Will Meet in Russia

The Seventh Congress of the International Association for Testing Materials will be held under the patronage of the Czar of Russia, in St. Petersburg, from August 12-17, 1915. Four days will be devoted to the discussion of the most important problems on testing materials. After the congress, extensive excursions in the interior of Russia have been arranged.

The equipment of the Victor Knecht Co., 819 Wade street, Cincinnati, will be sold at receiver's sale on July 1. Articles offered for sale will include all machinery, foundry tools and equipment, scales, flasks and office fixtures. The Victor Knecht Co. operated a foundry at the above address and was also proprietor of the Phoenix Foundry Co., Cincinnati.

The Gee & Ludwig Co., Harrison building, Philadelphia, has been appointed district representative for the Interstate Iron & Steel Co., Chicago. The product of the latter company consists of bars, small angles, channels, etc., and is used largely by bedstead and agricultural implement manufacturers.

The E. J. Woodison Co., Detroit, manufacturer of foundry supplies and equipment, has established a Buffalo office at 378 Ellicott Square building, in charge of Pierce G. Smith.

Follansbee Bros. Co. has moved its office to 2025 Continental & Commercial National Bank building, Chicago.

Maintaining a Machine's Output

The Productograph by Recording Operations of Your Machine Tool Enables You to Procure Maximum Production

EVERY factory manager occasionally finds himself confronted with the vexing problem of how to make a machine turn out the quantity of work which he believes it is capable of producing. He may know, for example, that it can turn out a certain number of pieces per minute, but, somehow, its daily output persists in falling far short of this number multiplied by the number of minutes in the working day.

Such inefficient operation of a machine may owe its origin to any one of a variety of causes. The machine may have some defect which results in faulty operation; it may be halted temporarily because of a breakdown or failure of the power supply. The operator may shut down the machine frequently without any cause other than his desire to take a rest; or he may be lax in feeding raw material into the machine, or in otherwise attending to it.

Whatever the reason, the factory manager in the majority of instances, does not learn of the delay until some time after it has occurred. Usually he must accept the explanation of the operator, who, naturally, is not inclined to shoulder any blame himself. In many plants where there is little system, these delays may never become known. The manager, although aware that the operating efficiency is not what it ought to be, does not know definitely what the reason is.

To solve this very problem and to enable the factory manager to know at all times just what the various machines in his shop are doing, there has been put upon the market a very interesting device called the Productograph. This device may be installed directly on the manager's desk, thus enabling him when the operation of any particular machine is recorded unsatisfactorily, to inquire immediately into the cause and remedy the trouble without delay. The Productograph records the movement, per stroke or revolution, of each machine to which it is connected, the record comprising the exact starting time, the hour of each stoppage, the duration of each stop to the minute, the rate of production, changes in the rate of production and, finally, the output of the particular machine for the day.

The Productograph consists of a revolving cylinder, a series of magnets, and a corresponding series of needles. When energized, the magnets attract the needles, thus causing lines to be drawn on the chart which is mounted on the revolving cylinder. This chart is of lead paper and is spaced to show each hour and minute in the working day. From the magnet coils of the Productograph, wires are run to switches located on the various machines in the shop. Each switch consists of a small cast iron box, which is fastened close to a revolving shaft or other part of the machine where the motion may be taken off easily by the switch arm.

Inside this cast iron box is a reduction gear; that is, for every ten move-

FIG. 1—SWITCH CONNECTION FOR RECORDING MOVEMENTS OF PUNCHING PRESS PLUNGER

ments of the switch arm one contact is made, thus causing one line to be drawn on the chart in the Productograph. This reducing gear can be made to operate in any other ratio desired. It is advantageous, however, to make the ratio some multiple of ten, since the chart thus may be read with greater facility. The reducing gear actuates a plunger in an air chamber, which in turn, makes the contact by bringing two springs together. Immediately after making the contact the plunger returns to its original position, so that no matter in what position the machine is left on stopping, the switch cannot be short-circuited.

The Productograph has been used with great success in various kinds of plants, including machine shops, hardware manufacturing plants, paper mills, printing establishments, pumping stations, etc. Its field of usefulness is extremely wide, embracing nearly every kind of machinery. The installation of such a system is comparatively a simple matter. The accompanying illustrations show the manner in which the apparatus is connected to the machinery in the shop.

In Fig. 1, is shown a punching press, installed in a metal novelties plant. In this case, the production of the press depends upon the movements of the plunger; hence, the switch for recording the performance of the machine is attached to the plunger.

Fig. 2 gives detailed view of a vertical turret lathe, provided with switches to record the movements of the cross rail head vertical feed, cross rail head horizontal feed, table or chuck speed, side head horizontal feed and side head vertical feed. As is clearly indicated in these illustrations, the installation of the recording apparatus in no way interferes with the operation and free access to every part of the machine to which it is connected.

Fig. 3 shows a vertical turret lathe which is provided with switches which record the movement of both the horizontal and the vertical feeds.

In Fig. 5 is reproduced a chart from a five-needle Productograph, which was employed to record the movements of five machines in a stamping factory. These machines were stationed alongside each other, were of similar type, construction and capacity, and operated on the same kind of work. The switches on each machine were so geared that each long line on the chart indicated a production of 100 pieces. This chart shows the operation of the machine from shortly after 11 o'clock until five o'clock.

Beginning with No. 1, the column at the extreme left shows this machine stopped about 11:25 a. m., ran five minutes at about 11:50 and for another five minutes about 1:05. It was found upon examination that the machine had been giving trouble for some time but had been neglected.

Machine No. 2, in the second column from the left, showed a fairly constant day's run, with an average production of about 900 pieces per hour. The record, however, showed that the machine was shut down a few minutes before stopping at noon and at night; it also

showed several short stops at different times through the day. When added up, these various delays were found to aggregate one-half hour, which had been lost between 11 o'clock and five. On examining into this case, the manager found the operator of the machine was given to occasional soldiering, which previously had been entirely unsuspected.

The records for machines Nos. 3 and 4, each showed an aggregate loss of one-half hour each; the record also revealed that the two operators had shut down their machines at 1:25, starting them again simultaneously at 1:40, indicating that they evidently had gone out to "talk things over". The factory manager investigated this and found this to have been the case. The record also showed a production on machine No. 3, between 11:30 and 12 o'clock, of about 600, while between 2:30 and 3 o'clock, it showed a production of about 360, indicating that the operator was not as energetic in the afternoon as in the morning.

Machine No. 5 showed a good record, with the exception of the delay from 1:10 to 2:20 o'clock, which was due to getting ready. This operator also showed a propensity toward shutting down his machine slightly in advance of the time for the whistle to blow. The record gave the factory manager at this plant data which enabled him greatly to increase the operating efficiency of his machinery.

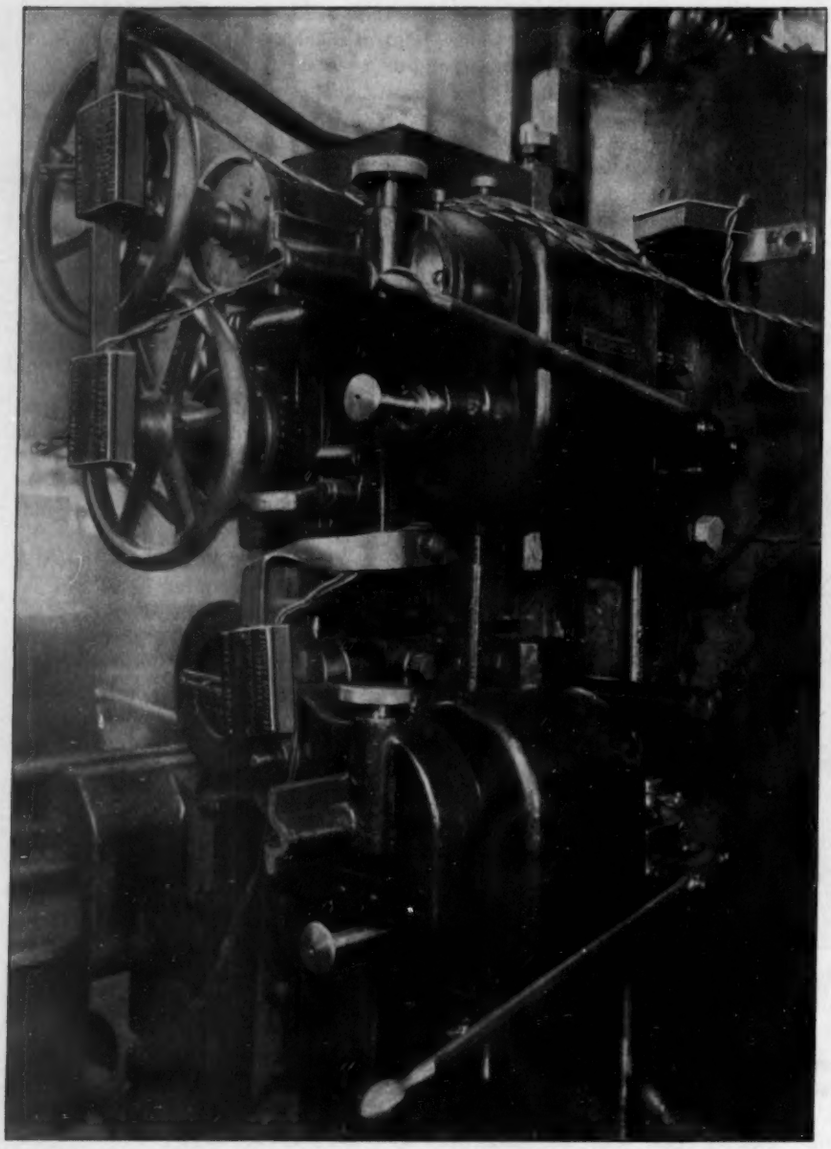


FIG. 2—METHOD OF INSTALLING SWITCHES TO RECORD MOVEMENTS OF VARIOUS FEEDS IN VERTICAL TURRET LATHE

The Productograph is made in four sizes: a two-needle instrument, to report the movement of one or two machines; a five-needle instrument, for recording the movement of five machines or less; a ten-needle instrument for recording the movements of ten machines or less and a 20-needle instrument, which can record the movements of 20 machines or less. For operating a five-needle Productograph, about the same quantity of electricity at 16 volts is consumed as is required for feeding an ordinary electric incandescent lamp. The two larger instruments require a correspondingly greater supply of current. The Productograph is manufactured and sold by Slocum, Avram & Slocum, Inc., 30 Church street, New York City. This concern maintains an engineering department which makes a specialty of adapting the use of the Productograph to machinery of which the motions are unusually hard to record.

How Large Structures Are Moved

The principles involved in the moving of large structures were discussed recently by George W. Nichols, chief engineer, John Eichleay Jr. Co., Pittsburgh before members of the mechanical section of the Engineers' Society of Western Pennsylvania.

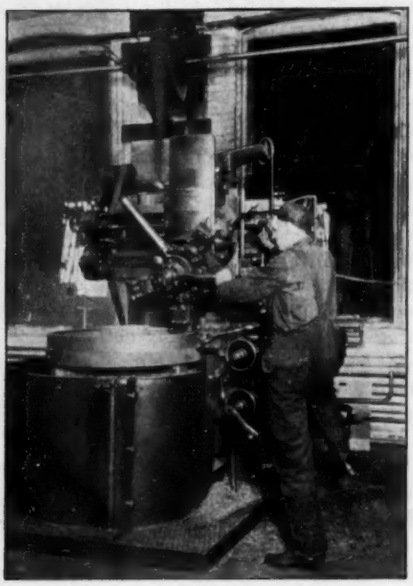


FIG. 3—LATHE WITH SWITCHES FOR RECORDING MOVEMENTS OF HORIZONTAL AND VERTICAL FEEDS

The ancients possessed considerable knowledge concerning principles involved in moving heavy bodies, as the skill they acquired in building temples and palaces indicates. He cited instances in which ancients set massive stones, weighing 50 tons in many cases, hundreds of feet above the ground. Many large stones have been located in the Pyramid of Cheops. These probably were placed in position by building gradual ascents to the point at which construction work was under way. Roads were removed upon completion of the work.

Mr. Nichols spoke particularly about

the supporting, raising and bringing to line of the South Twenty-second street bridge, Pittsburgh; moving the Erie coal dumper at Cleveland; moving a new 100-foot bridge of steel construction at Pittsburgh and the moving and turning of a three-story office building at Glenns Falls, N. Y.

Shortly after the South Twenty-second street bridge at Pittsburgh was opened to traffic in 1897, a settlement in the river piers was discovered and it was decided to bring this bridge to line, remove and rebuild the two river piers. This structure consists of a 520-foot channel span with two approach spans of 260 feet each. The bridge trusses are 32-foot on centers. The roadway is 27 feet wide and the two sidewalks are each 11 feet wide.

The Dravo Contracting Co., Pittsburgh, was awarded the contract for the supporting of the bridge and the reconstruction of the two piers; the building of false work and supporting of the bridge while piers were removed and replaced was sub-let to the

FIG. 4—PRODUCTOGRAPH FOR 10 MACHINES OR LESS

Eichleay company. A rather novel method was used in supporting the bridge. Mr. Nichols explained that ends of the 520-foot trusses were suspended from two steel lift trusses which spanned the old pier. Ends were supported by false work on either side of the pier. The loading on false work was estimated at 2,000 tons, 1,500 tons of which were taken care of by a lifting device, constructed of triangular trusses. The bridge was brought to level by screws. Piers were removed and replaced by new ones. It took two years to complete work on the piers.

The car-dumper owned by the Erie railroad, used for loading vessels with bituminous coal for shipment to upper lake points, lost its usefulness when officials of Cuyahoga county decided upon the location as the site for one of the piers supporting the new Detroit-Superior viaduct at Cleveland. It was decided to move the car-dumper along the front of the Cuyahoga river, a distance of 214 feet. The contract for this work was awarded the Eichleay company, which agreed to move the dumper, built by the Wellman-Seaver Morgan Co., as a unit.

When the pans are elevated, the car-dumper superstructure is 116 feet high, 38 feet 6 inches wide and 56 feet long. The main structure is carried on four columns; the loading on the two front columns is about 250 tons and the rear columns carry about 80 tons. Including boilers, brick work, engines and machinery, the car dumper weighs approximately 800 tons. It was necessary to move the car dumper over a platform 100 feet long. The two front columns were raised by clamping two 24 x 80-inch I beams, 16 feet long, to each column. The other columns were caught up by clamping 12 x 12-inch timbers to either side. Brick work encasing the three Sterling boilers, was raised by steel I beams. The entire structure was raised 3 feet. Beams were placed under the structure to form bearings for the rollers. The structure gradually was moved over to the new foundations by means of two winches and blocks, horses furnishing the power. It took 22 days to make the necessary preparations, while the actual raising, moving and lowering was accomplished in eight days. He also

(*Continued on Page* 1148*b*.)

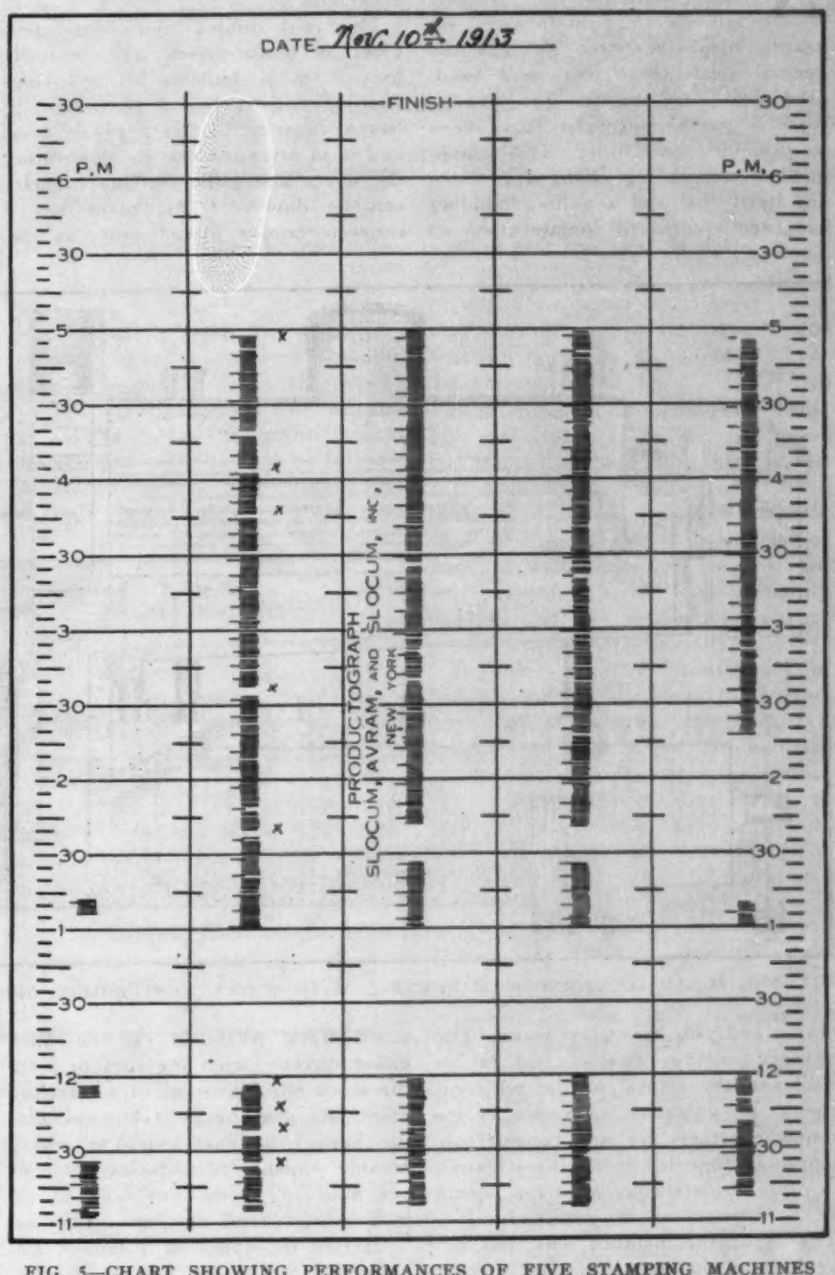


FIG. 5—CHART SHOWING PERFORMANCES OF FIVE STAMPING MACHINES

Powdered Fuel in a Forge Shop

Description of Installation at Works of American Locomotive Co. With Results of Tests

BY WILLIAM DALTON AND W S QUIGLEY

AT THE works of the American Locomotive Co., Schenectady, N. Y., oil furnaces for heating blanks for drop forgings and general small forge work and hand-fired coal furnaces for the heavier work in the hammer shop have been in use for some time. This equipment is now being changed to burn powdered coal and a milling building has been erected to contain the coal drying and pulverizing apparatus. The advance in the price of fuel oil in 1912 and the refusal of the oil companies to guarantee deliveries or to renew contracts for any considerable length of time led to an investigation in order to determine what fuel would be a satisfactory substitute for oil. The apparatus installed was that developed by the American Iron & Steel Manufacturing Co. at its Lebanon and Reading works and now handled by the Quigley Furnace & Foundry Co., New York. The plant was built and started in May, 1913, and while there has been the usual amount of trouble in getting a new fuel system to run smoothly, the results have been satisfactory.

The coal milling and distributing plant is motor-driven and centrally located in a building of non-combustible construction. At present it has a capacity of five tons an hour and is so arranged that by duplicating the dryer and pulverizer its capacity can be doubled. This plant has a concrete hopper placed under an elevated track where it can be filled either directly from the cars or from the stock pile by means of a traveling crane and grab bucket. The concrete car hopper discharges into a rotary crusher capable of reducing 20 tons per hour of run-of-mine coal to ¾-inch cubes. From the latter the coal is carried by means of a bucket elevator to a storage bin which discharges by means of chutes and a reciprocating feeder into an indirect-heat type dryer of six tons per hour capacity. From here it is elevated to a dried coal storage bin arranged to feed by chutes directly into the pulverizer, then elevated to a pulverized coal storage bin, from which it is distributed by screw conveyors to the drop forge and hammer shops. The plans permit of further extension to the blacksmith shop, power plant and other departments later.

The milling building is detached, well ventilated, and built in conformity with the underwriters' requirements and accepted by them on a par with buildings containing equipment for fuel oil or gas for industrial purposes. There has been no trouble whatever from spontaneous combustion, or fires from other causes, and there appears to be no reason to expect trouble from this source if ordinary precaution is used, as required with any other kind of fuel.

To insure the best results, the coal should be of high volatile and low ash and should be dried so as to contain not over 0.5 per cent moisture, care being taken in drying to avoid overheating and so driving off any of the volatile content. The coal should be pulverized to a fineness that will permit 93 to 95 per cent to pass through a 100-mesh sieve, and for some classes of work even a greater degree of fineness has been found desirable.

In the burning of powdered coal, the fuel controlling device is the most

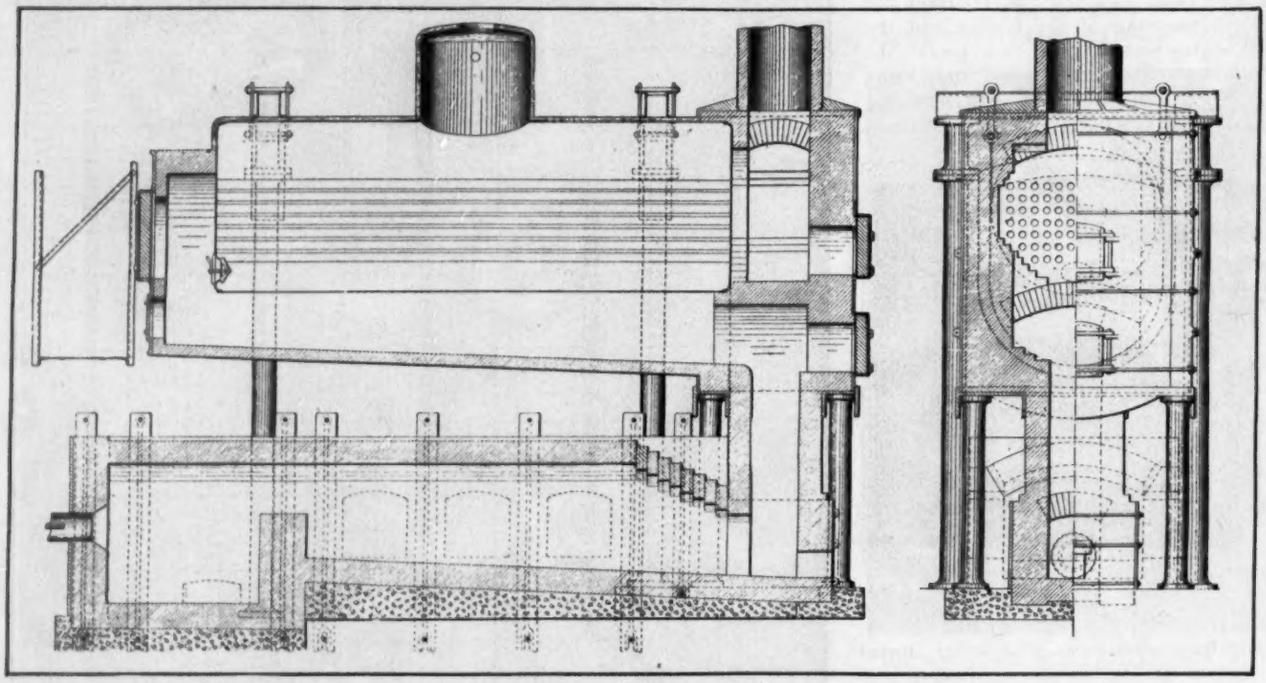


FIG. 1—DIAGRAM OF THREE-DOOR FURNACE WITH WASTE HEAT BOILER ARRANGED FOR BURNING POWDERED FUEL

Paper presented at spring meeting of American Society of Mechanical Engineers in St. Paul, June 16-19.

essential element in the successful operation of the system as a uniform and controllable supply of the powdered coal must be supplied to the burner at all times. The controller used in this installation was developed by the American Iron & Steel Mfg. Co., and used successfully by them for seven years.

The furnaces in the drop shop are rebuilt oil furnaces and those in the hammer shop are rebuilt hand-fired coal furnaces, and it should be emphatically stated that it is a serious mistake to attempt to apply powdered coal to existing furnaces without rebuilding them in a manner best suited to that fuel, since rapid and economical operation, as well as the elimination of the ash, cannot be accomplished without properly designing the furnaces for the new fuel. Coal has been burned in this plant with an ash content as high as 18 per cent with uniformly good results, although the high ash causes considerable annoyance where open furnaces, such as those designed for heating small forgings, rods, etc., without doors are used or where doors are not wholly closed during operation, unless efficient hoods or an exhaust system for properly disposing of the small particles of escaping ash is installed.

After the first two furnaces were equipped in the drop shop and one in the hammer shop, tests were made to determine the cost of powdered fuel as compared with fuel oil and hand-fired coal practice; and also as to what changes needed to be carried out in the alterations upon the other furnaces. The results of the tests upon these first furnaces are given in the accompanying tables.

The powdered coal furnace ran 57 minutes longer than the oil furnace. However, 30 minutes were lost because of failure to charge furnace on Nov. 12, and 18 minutes were lost on Nov. 13, because the plate for heating the dies was not put in at the proper time.

The work was on pedestal die wedges, which are of iron. The blocks weigh 25 pounds and the forgings 16 pounds. The time lost on the pulverized coal furnace would more than allow for making the 12 forgings, so that the amount turned out by each furnace should be considered equal.

Table I.

COMPARISON OF PULVERIZED COAL FURNACE NO. 3335 AND OIL FURNACE NO. 5078, BOTH SAME SIZE, IN DROP SHOP

	Pulverized Coal Furnace No. 3335.	Fuel Oil Furnace No. 5078.
Hours run	10 hr. 22 min.	9 hr. 25 min.
Fuel consumed	2,177 lb. coal	138 gal. oil
Average time per heat	25.1 min.	25.8 min.
Average time per forging	1.87 min.	1.47 min.
Actual forgings	122	132
Forgings to be counted	132	132
Cost of fuel at contract price	$2.82 ($2.56 ton)	$6.69 (4.8 ct. gal.)
Cost of fuel delivered to the furnace	$3.31	$6.89

Some weight should be given the fact that the oil costs were probably kept at a minimum, as the heater was thoroughly familiar with oil and was able to obtain the maximum heat with the minimum amount of fuel oil. The same men ran each furnace and the only factor of importance was that the ram used on the hammer at the oil furnace was about 500 pounds heavier than the ram on the hammer at the coal furnace. This did not affect the time of heats, but allowed a quicker forging time and there was less time lost with nothing in the furnace. It will be noticed from the coal analysis, Table II, that the coal contained over 14 per cent of ash, which is too high for the efficient use of pulverized coal. The volatile matter analyzed low, but as this coal has been running above 30 per cent in volatile matter, it is believed there must have been some fault in the analysis in this respect and investigations are now being made regarding it. The above results show the cost of operating the furnace on pulverized coal during these tests was 48 per cent of operating it on fuel oil at the present price.

Table II.

COAL ANALYSIS

Ash	14.12
Volatile matter	20.28
Fixed carbon	64.60
	100.00
Fineness, per cent	98.4
B. T. U.	13,220

Table III.

COMPARISON OF TESTS ON LARGE 3-DOOR FORGE FURNACES OF SAME SIZE UNDER WASTE HEAT BOILERS NOS. 45 AND 61

	Boiler No. 45 Mine Run Coal.	Boiler No. 61 Pulverized Coal.
Hours run	10 hr. 5 min.	9 hr. 30 min.
Fuel consumed	4,630 lb.	3,200 lb.
Average time per heat	117 min.	120 min.
Cost of fuel actually delivered	$6.69	$4.14
Tonnage per furnace	9,920	9,920
Cost of milling, conveying and blast	$0.48	$1.04
Total cost of fuel burned	$7.17	$5.18
Cost per ton output	$1.45	$1.05

No. 45, old style furnace burning mine run coal, hand fired. Nov. 12, 1913.
No. 61, new furnace equipped to burn pulverized slack coal. Nov. 21, 1913.

Both furnaces compared in Table III ran under favorable conditions and the men on both hammers turned out a fair average day's work. Both furnaces were on the same class of work and heated the same amount of material. The blast and rate of feed on pulverized coal was properly handled and the heats came out at proper temperature of working.

In comparing the maintenance of the two styles of furnaces, the pulverized coal furnace had not been run long enough to make an accurate comparison, but indications are that the maintenance of the pulverized coal will not exceed that on the old style and will probably run less. The saving in labor with the pulverized coal furnace is shown to be:

Three men on ashes at $1.75	$5.25
Three men on fires nights at $2.10	6.30
Per 24 hours run	$11.55

Based on the shop running at average capacity there would be a labor saving of $11.55. This allows for men to start furnaces in the morning and wheel away ashes and slag. From these reports it will be noted that the air pressure required for burning powdered coal is materially less than that used on either oil or hand-fired coal furnaces. Owing to this decrease it was found necessary to lengthen the stack on the waste heat boiler to increase the draft and afford a better circulation.

The Roberts furnace, built in 1862 by the late Geo. B. Roberts, later president of the Pennsylvania railroad, which long was an industrial landmark in Allentown, Pa., is being torn down to make room for pump works.

Electric Furnace for Annealing

An electric heating furnace for annealing brass and German silver flat ware blanks recently has been installed in a plated tableware manufactory at Niagara Falls, N. Y. The furnace framework is made of steel, and is 15 feet long, 8 feet wide and 7 feet 6 inches high. Doors are located at both ends of the furnace.

A mechanical charger, operated by compressed air cylinders which run over cast iron idler sheaves, operates the pusher mechanism located at the charging end of the furnace. The material under treatment is packed in 20-inch square steel pans which are forced through one after another, seven pans being in the furnace at one time. The pans passing through the furnace are supported by a hearth of cast iron grids 24 inches square.

The pan when discharged is dumped automatically into a water sealed discharge hood. The metal under treatment falls into a tank of either clear water or pickling solution, depending upon the cleanliness of the material before it is charged. The pan is caught by two rails and held suspended above the trough. It may be taken out from under the water-sealed hood through the counter-balanced swing door shown in Fig. 2.

In operating the furnace, a pan of flat ware is placed on the runway in front of the pusher, as shown in Fig. 1. The small hand lever shown near the top of the furnace frame, operates the air valve on the cylinder on the top of the furnace. The first movement of the cylinder raises both doors enough to admit the pans, which are 3 inches high.

A stop on the cable holds the doors at this height, while the pan of fresh material is pushed into the furnace. As the fresh pan enters the pan at the discharge end is pushed clear onto a dumping carriage. Its own weight automatically tips the pan dumping the contents into a hopper, the lower end of which is submerged in the quenching tank.

The annealed material falls into a perforated copper basket, which at intervals is lifted out of the quenching tank. As the pan starts to tilt, the pusher carriage is pulled out of the charging end and the doors are dropped.

Thus, in this furnace, the material is not exposed to the atmosphere at any time after entering until taken cold from the quenching tank. This entirely eliminates the possibility of oxidation as the furnace itself has a reducing atmosphere.

The electrical equipment consists of a special 200 kilovolt-ampere transformer, built by the Pittsburgh Transformer Co. It is arranged with 12 voltage taps, connected to the special controller shown in Fig. 1. The switching mechanism permits a close regulation of the voltage. On the switch-board panel is a Weston wattmeter and a Foxboro pyrometer, as shown in Fig. 1. The pyrometer is connected to a 48-inch couple placed at the discharge end of the furnace, thus showing at what temperature the material is drawn.

Among the advantages of a continuous electric furnace for this class of work is the fact that desired temperatures may be reached with precision and without danger of overheating, while the ruling temperature at the furnace end is no higher than the temperature desired in the metal.

This furnace was designed and installed by the Electric Furnace Co. of America, Alliance, O. This company recently has received a duplicate order for a furnace of the same size and capacity for installation in the same plant.

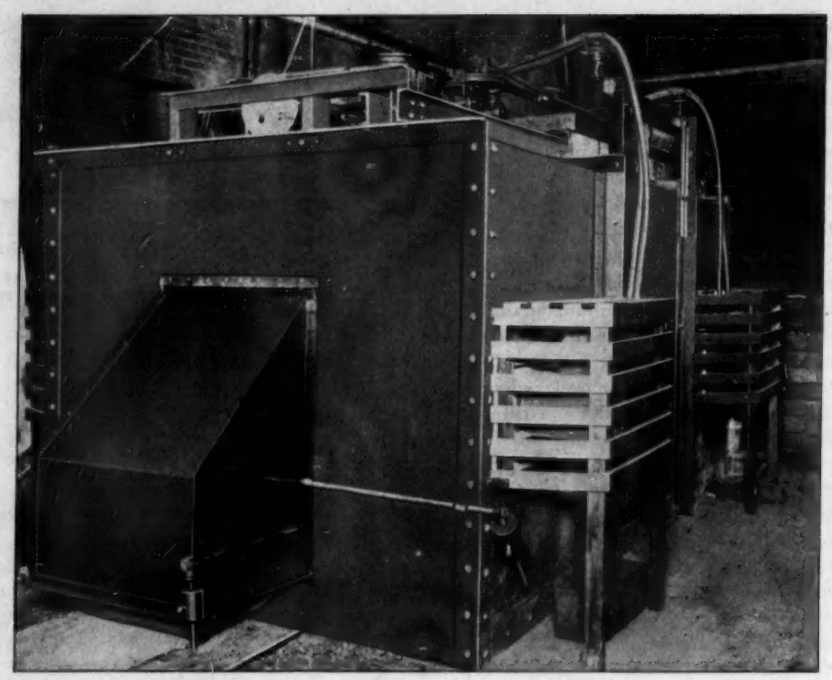


FIG. 2—DISCHARGE SIDE OF FURNACE

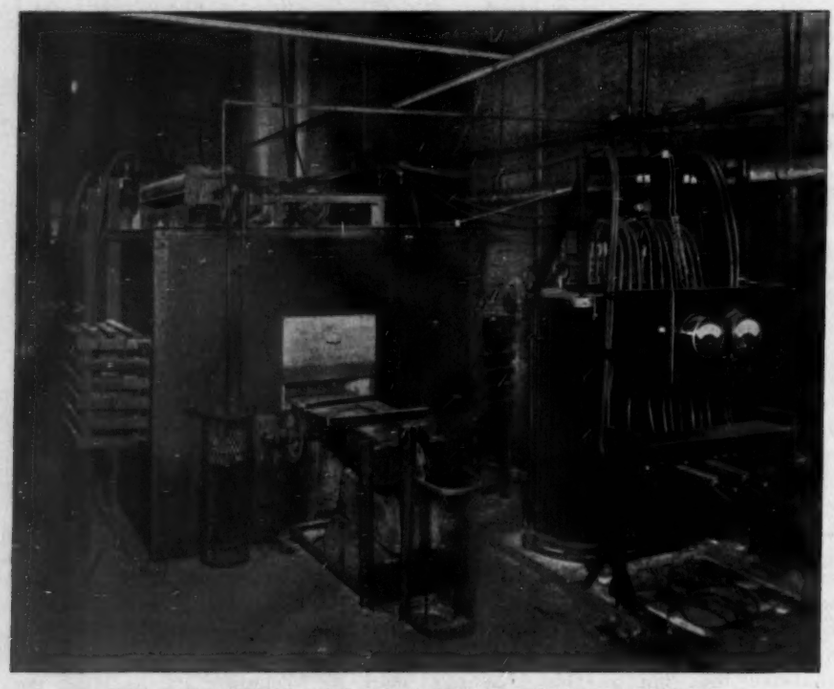


FIG. 1—CHARGING SIDE OF ELECTRIC HEATING FURNACE

Safety First in Pattern Shop

Injuries Caused by Woodworking Machines Are Usually Severe, But May Be Avoided Almost Entirely by Adopting Proper Safeguards

BY MANCIUS S HUTTON

THE accidents which happen to those operating wood - working machinery are likely to be serious and permanent in nature. Exhaustive statistics show that they are only exceeded in number by those which are caused by stamping, punching and drilling machines. They, however, can be largely prevented by placing safeguards over the danger zones of the machines. Each safeguard should, if possible, meet four conditions:

It must not hamper the workman by preventing him from turning out the maximum number of pieces per day.

It must be of such a nature that it can be easily adjusted without consuming time when changing the character of the work.

It would be advisable to have it so fastened to the machine that it cannot be easily removed and thrown aside by an employe when using the machine, which occurs frequently in shops.

It should be fool-proof.

It is not often that a safeguard can be found that will measure fully up to all the four conditions mentioned above, but it is advisable to have these in mind when selecting a guard for protecting a particular danger zone of a machine.

In practically all pattern shops the following four machines will be found: Circular saws, band saws, lathes and jointers. In the larger up-to-date shops there will be found, besides the above, the following three machines: Shapers, surfacers and universal wood workers. Of these seven machines, the circular saw, band saw, shaper and jointer are by far the most dangerous to operate. The other machines do not have many exposed parts to come in contact with the operator and they can be guarded at a small expense.

FIG. 1—FINGERS CUT BY JOINTER HEAD

The circular saw is the machine which is used the most and at the same time it is the most dangerous of all woodworking tools. There are three types of circular saws, namely, the rip, cut-off and swing. The last type is not used in pattern shops. The guards, later described, will be equally serviceable in protecting the workman using either the rip or the cut-off saws, as the same dangers are present in both.

The two accidents which are likely to happen to an operator using a circular saw are, first, the probability of the man getting his hand or fingers in front of the teeth of the saw; and, second, of the wood which is being cut, becoming pinched at the back, throwing the piece in an opposite direction to which it is being fed.

When a saw is revolving at high speed, the space between the teeth showes up lighter than the solid part of the blade, making the saw seem to be smaller in diameter than it actually is. To prevent the possibility of the operator's fingers or hand coming in contact with the saw, a hood should be placed over it. This hood can be made of either metal or wood or a combination of both. It should cover the sides as well as the top. The guard should be arranged so that it will cover the saw completely

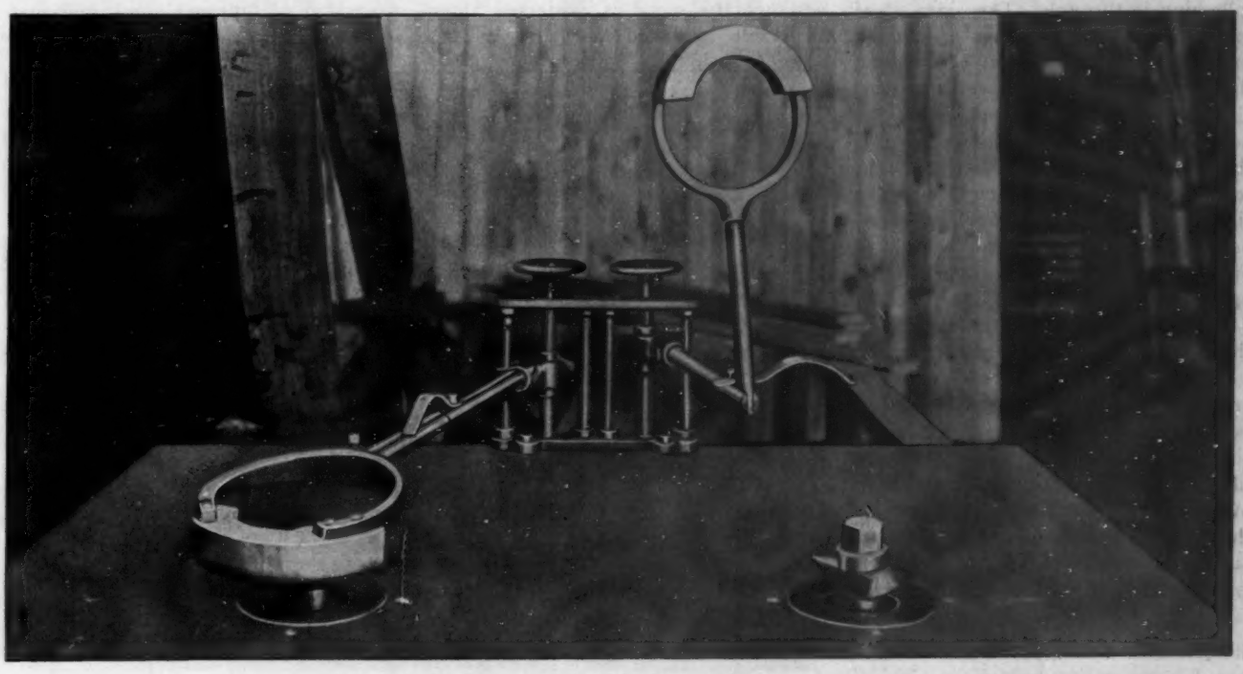


FIG. 2—ADJUSTABLE RING TYPE SHAPER GUARD

FIG. 3—RISING TYPE OF JOINTER GUARD

when not in use and will adjust itself automatically for various thicknesses of stock without requiring hand adjustment. As an operator usually cuts a piece with the saw by either a line on the wood or by judging the same with his eye, it is quite essential that the top of the guard should be open and the front should have a small lip for starting his work and following it through. The sides, if of metal, should be at least a half an inch from the blade, but if of wood, they can be brought closer together. The reason for this is that unless the hood or saw is absolutely steady, there will be the possibility that the teeth may come in contact with the sides, injuring them. The hood must be so attached that it can be moved out of the way of the saw when the operator wants to make a change or do repair work. It is usual to have the hood attached either by a counterweighted rod to the ceiling or to an arm fastened to the side of the table. The saw table in a pattern shop either is of the tilting or nontilting type. The guard suspended overhead can be used on either of them, but the guard attached to the table can be used only on the latter type.

As previously stated, the second danger with this type of saw is that due to the stock becoming pinched and thrown away from the saw. The force with which the piece may leave the saw is sometimes tremendous, especially if it is heavy stock. Pieces have been known to be hurled long distances doing great damage in their flight. Many a man has lost his life by being struck with one of these pieces of flying stock. It depends somewhat on the weight of the stock whether the wood is projected along the table or lifted and thrown at a tangent to the saw blade, the heavier stock being in the former class while the lighter materials are the ones which are apt to be lifted before being projected from the blade. The reason why stock which is being cut is liable to be thrown from the operator's hand is that the sides of the freshly-cut part of the piece come in contact with the rear teeth of the saw. Therefore, an accident could be prevented if these sides are separated as is done by means of what is known as a splitter, or if means are found to hold the stock from moving except in the direction of feeding. This is accomplished by what the writer proposes to call a dog. The splitter, or spreader, as it is called, consists of a piece of steel fastened to the table at the rear of the saw and in its plane. It is beveled at the edge nearest the saw and is made a little thicker at its rear than at the front, the thickness at the front being the same as the thickness of the saw blade.

Construction of the Dog

The dog consists of a curved lever pivoted to the hood, with ratchet teeth on its under side. The teeth of this lever have their backs sloped in the direction in which the stock is moving, allowing the piece to slip by when being fed normally; but should the saw teeth tend to reverse the motion of the stock, their sharp crests dig into the wood and arrest the motion in that direction. A safety device which is to prevent circular saw accidents, therefore, should consist of both the hood and either the spreader or the dog. At present a number of different companies manufacture these safeguards for sale,

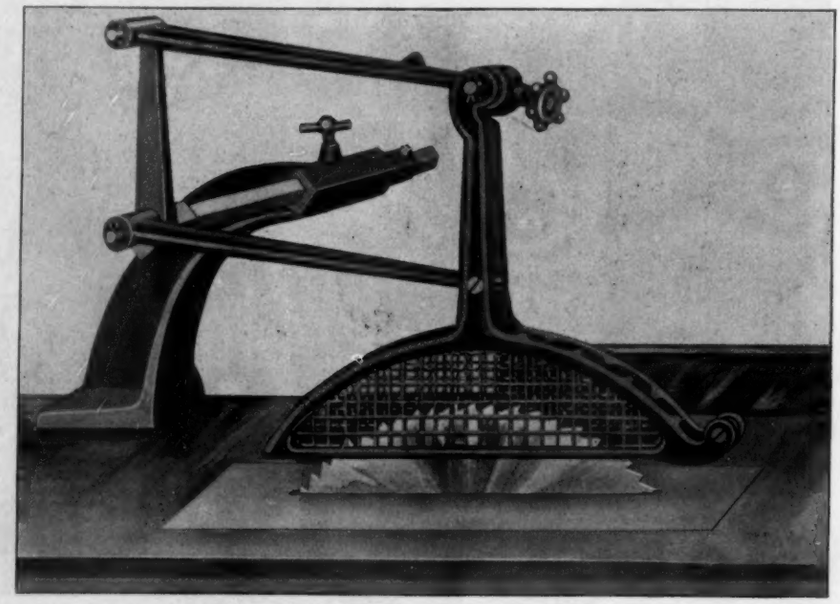


FIG. 4—CIRCULAR SAW GUARD ATTACHED TO THE TABLE SIDE

and in addition, a number of manufacturers using saws have attached guards which they designed and built in their own plant. Fig. 6 shows a hood which is suspended overhead and Fig. 4 illustrates the hood attached to the side of the table. A guard which can be cheaply made and at the same time meet conditions, will be one having a hood whose sides are two pieces of wood held together by a wire mesh across the top and sides. The hood may be attached to the side of the table at the rear by means of an arm and have a dog fastened to one of its sides at the bottom and close to the rear. A sawyer should never stand in front of the work nor should he use his breast or abdomen for feeding a piece.

Use of Band Saw

The band saw is much safer to operate than the circular saw and the accidents which are liable to occur are not so serious. There are two dangers to contend against, but the guard which will protect the workman from the one is just as serviceable in protecting him from the other. The first of these is caused by the band saw slipping off from either the upper or lower wheel, and the second by its breakage.

Covering the two sides of both wheels with wood, slats, metal or a wire mesh guard will prevent the band from slipping off provided the sides are brought close enough together. Both of these wheel guards should be so arranged that one side can be opened in case a new saw is to be put on or to replace the broken or dull one. It is sometimes arranged so that the upper wheel guard can be slipped off instead of having a side opening. Should there be no covering over the upper wheel and the saw slips off, the operator probably will get his hand or face, or both, badly cut with the teeth of the saw, unless he is fortunate in getting out of its path. If there is no guard over the lower wheel, his legs will be cut. If the return part of the blade should be exposed, the operator or some one else may come in contact with it or the saw may be struck from the rear and thrown off the wheels. This part of the machine may be protected with two strips of wood or metal between which the blade moves.

FIG. 6—CIRCULAR SAW GUARD SUSPENDED FROM OVERHEAD

FIG. 5—SLIDING TYPE OF JOINTER GUARD

Guarding the Saw

Of the dangers mentioned, the second or the breakage of the saw blade is the one which causes more accidents to the operator than the former. For the upper wheel it will be necessary to cover its face so that the broken end cannot reach the operator and injure him. Enclosing the sides of the lower wheel also will be necessary. The wood or metal piece which fastens the two sides of the wheel guard will serve this purpose. It is quite necessary, in fact, imperative, that the working part of the blade should be guarded. First for protection in case of breakage, and second, to keep the operator's head from coming in contact with the saw when he bends over to follow the pencil lines which he desires to cut. If the machine had no guard for this purpose when it was bought from the manufacturer, one can be made of two strips of wood or metal on either side of the blade, arranged in such a manner that they can be raised or lowered to any desired height, leaving exposed only that

part of the saw in actual use. Fig. 9 illustrates a machine which has all parts fully protected.

The jointer, or buzz planer, ranks next to the circular saw in its capacity for doing bodily harm to the operator. The dangers are those due to the fact that the operator, in most cases, has to depend wholly upon his hands for the control of his work. The accidents which happen are due

FIG. 7—CYLINDRICAL CUTTER HEAD FOR JOINTER

to two causes. Should the operator stand in front of the planer, the work may fly back and strike him in the abdomen, causing an injury which may be serious. The only way to prevent this is to see that all the employes are instructed to feed the stock when standing at the side of the machine. Not only they be instructed, but it should be seen that this rule is implicitly followed. The second danger is that due to the operator getting his fingers in the path of the revolving knife head. To plane the stock, the operator must push it with both his hands over the gap between the two halves of the table in which the knife head is revolving. Besides pushing the stock he must bear down on it in order to obtain the desired depth of cut. Should there be a knot or a change in the grain of the stock, or should too heavy a cut be taken, this will cause it to fly out from underneath the operator's hand and allow the latter to drop down over the cutter. To lessen the amount of injury, the jointer should be provided with a cylindrical head. The use of the old style square head results in a far more serious accident than that due to the cylindrical one, as is illustrated in Fig 1. These two types of knife heads are illustrated in Figs. 7 and 8. Besides having a cylindrical cutter head, there should be provided some type of safety device to be placed over the gap between the two halves of the table in which the cutter revolves.

There are two types of guards manufactured for this purpose which are called the sliding and the rising type. In the former class the guard, which is of wood or metal, is pushed aside by the approaching material, uncovering only so much of the knife length as is required for the work. As soon as the material has passed by, a spring brings the guard back to its original position over the knives. This type of guard is illustrated in Fig. 5. The rising type of guard is one that can be adjusted horizontally as well as vertically or swung to one side to meet various conditions in planing. It is usually made of solid or perforated metal. The guard is supposed to be adjusted vertically so that it lies on top of the material being planed, in which position the hands will be forced over the top of the guard when they reach it. Fig. 3 illustrates this type of guard. There are now in use self-feeding jointers which eliminate much of the danger attached to the operation of the machine. In working short pieces special care should be exercised in feeding because the pieces due to their lightness and the difficulty of holding them close to the table are liable to be projected from the table by the knives placing the fingers of the operator in danger. For such pieces the danger to the operator will be minimized by the use of a push block made in the shape of a hand plane with a cleat at the back to place over the end of the stock. On the underside of the block is a notched metal plate to hold the material firmly and prevent any sidewise movement.

If the belting at the lathe is covered by means of a wood or metal guard and a shield is placed over the face plate and spur gears, the machine would be protected over the most dangerous parts. There is al-

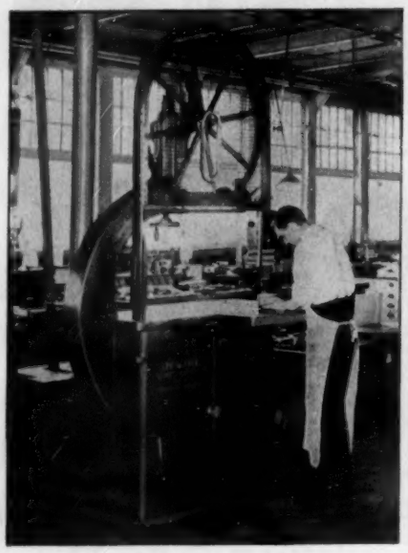


FIG. 9—BAND SAW GUARDED

ways the possibility of the tool slipping and bruising the hand, but in the hands of a competent workman this would never happen.

The shaper is exceptionally dangerous because of the necessity of running the knives at a high speed in order to give a smooth finish to the piece being cut and because of the fact that the wood must be guided by hand. There are a few cases in

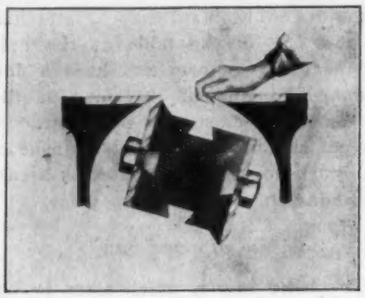


FIG. 8 — SQUARE CUTTER HEAD FOR JOINTER SHOWING DANGER OF ACCIDENT

which a guard with a self-feeding attachment can be used, but such cases do not often present themselves in a pattern shop. This machine is used for such a variety of work that it is particularly hard to find a universal guard. Guards are made, or can be made, which will serve most of the purposes required in a pattern shop. Such a guard must serve both as a protection against the dangers of the operator's hand getting in the way of the knives and at the same time must act as a tension on the piece. There are a number of American manufacturers who are selling shaper guards. Some of these are builders of woodworking machinery, others are manufacturers of different safety devices. The one illustrated in Fig. 2 is good. It consists of a horseshoe piece of wood attached to the forked end of a metal arm. This arm is connected at the other end to a vertical screw which is attached to the table as shown in the illustration. By moving the screw up or down the desired pressure on the work can be given by the guard. The arm is jointed so that one end can be lifted to make any changes to the knives. When it is in use, a spring supplies the proper tension so that the two halves of the arm act as a solid piece. It is essential that the chips and shavings should be kept away from the work. If there is no mechanical means of doing this, the operator is likely to try to brush them away with his fingers, thereby endangering them. It is for this reason that exhaust systems have been used quite extensively with this type of machine. The suction pipe open-

ing should be a flat orifice which can lie on the table close to the knives and it should be of such a nature that it can be swung around to any desired position. It should be further noted that if the knives are not securely fastened they may fly off the spindle to which they are attached and cause an accident. Therefore, the operator should see that they are held fast on the spindle before he starts the work.

The surfaces should have a substantial bar guard in front of the feed roll or entrance, to prevent the operator's hand following the stock into the rollers. It should be fastened to the frame carrying the roll so that it will be in adjustment for any thickness of stock. It is advisable to use a sectional feed roll to allow feeding stock of different thickness without the danger of the thinner pieces being kicked out.

Universal Woodworker

The universal woodworker does a large amount of work which formerly was done on several machines. It requires practically no guards, as the workman does not have to bring his hands near the cutters in order to operate the machine. This machine is one that is used only in pattern shops requiring special work.

The author wishes to acknowledge his indebtedness to the Lockhart-Hodge Co., Buffalo, for the photographs from which Figs. 2, 3 and 4 were made, and to the American Museum of Safety, New York, for Figs. 1, 5, 7, 8 and 9.

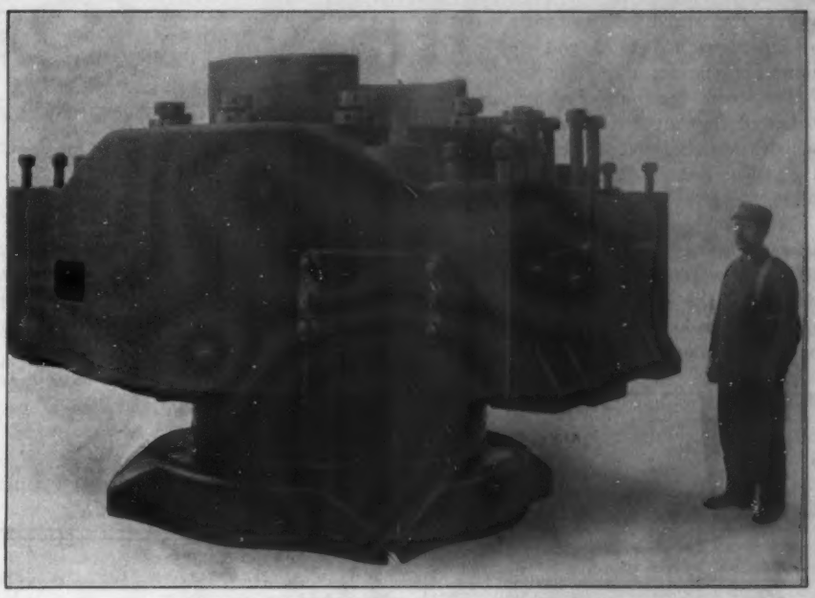


FIG. 2—STATIONARY BLANKHOLDER

Iron and Steel Institute Meeting

The autumn meeting of The Iron and Steel Institute will be held in Paris, Sept. 17, 18 and 19. On the conclusion of the meeting in Paris, a visit will be made to Nancy. The principal iron mines and metallurgical works of French Lorraine will also be visited on Sept. 21 and 22.

Two small pattern warehouses at the works of the Mesta Machine Co., Pittsburgh, were damaged by fire a few days ago. Fortunately, the company was not working on any of the patterns in these buildings, and it is officially announced that present operations and shipments of the Mesta company will not be affected. The plant continues to operate at full capacity, running two full turns a day.

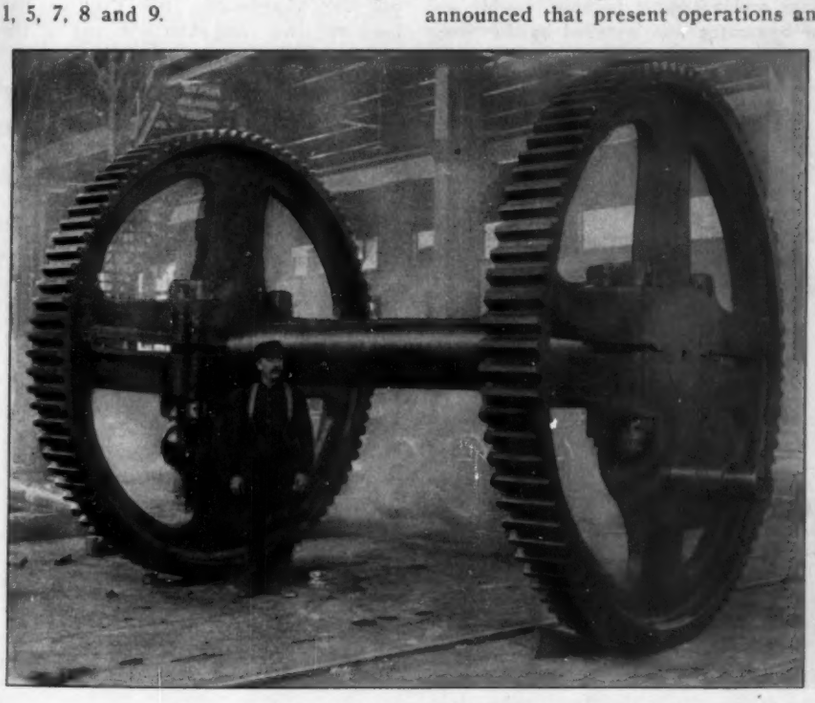


FIG. 1—MAIN GEARS OF BLISS DRAWING PRESS

Large Bliss Drawing Press

One of the largest drawing presses ever built recently was designed and built by the E. W. Bliss Co. It is of the tie rod construction type in which all the working strain is taken up by large vertical steel tie rods. The press has an extreme height of about 40 feet and weighs 650,000 pounds.

The press was designed to draw steel shells as large as 48 inches in diameter. It will draw and lift out shells as deep as 40 inches and draw and push through shells 45 inches deep. For lifting out shells, the stationary positive bottom knockout, which is adjustable for the different heights of shells, is used. Blanks as large as 64 inches in diameter and 3/16 inch thick may be drawn.

The table carrying the die is operated by a powerful toggle motion which connects on to the crank pins on the main gears. The plunger carrying the punch is operated by the steel cross head which is connected by two double connecting rods on to the crank pins on the main gears. The blankholder is stationary. All plunger and blankholder adjustments are accomplished by independent electric motors. There is a separate motor for each adjustment. While adjusting, the blankholder is locked and unlocked by an electric motor.

The entire train of gearing is of steel with machine cut teeth. The machine has three ratios of gearings, 200:1, 100:1 and 67:1. By means of change

gears, the speed of operation may be varied from 1½ to 3 and 4½ revolutions per minute.

The cross head and bed are counterbalanced by an hydraulic accumulator which may be placed above or below the floor line in the most convenient place.

The machine is driven by a 200-horsepower electric motor and is controlled by a powerful hand-actuated friction clutch of the double grip type. Additional dimensions of the press are given in the accompanying table.

DIMENSIONS OF BLISS DRAWING PRESS

Width between gibs	70 inches
Width between columns	81 inches
Area of top of table, R. & L. x F. & B.	68 x 68 inches
Opening in center of table (round)	31 inches
Distance table to blank-holder, table up, blank-holder adjustment up	52 inches
Adjustment of blank-holder	15 inches
Distance table to punch plunger, table up, plunger down, plunger adjustment up	63 inches
Adjustment of plunger	48 inches
Stroke of punch	52 inches
Stroke of table	42 inches
Will draw in depth and lift out, up to	38 inches
Will draw in depth and lift out with flat flanges, up to	40 inches
Will draw in depth and push through die, up to	45 inches
May be used for shells pushed through die and passing through table, not exceeding in diameter	24 inches
Largest punch diameter	50 inches
Largest blank diameter	64 inches
Maximum thickness of stock with largest blank diameter	⅞ inch
Diameter and width of flywheel pulley	76 x 20 inches
Weight of flywheel pulley	8,000 pounds
Speed of flywheel driving pulley	300 r. p. m.
Ratios of gearing	200, 100 and 67 :1
Strokes per minute	1½, 3 and 4½
Total height of machine	470 inches
Total width in pit, R. & L. x F. & B.	247 x 321 inches
Total width above floor line, R. & L. x F. & B.	163 x 127 inches

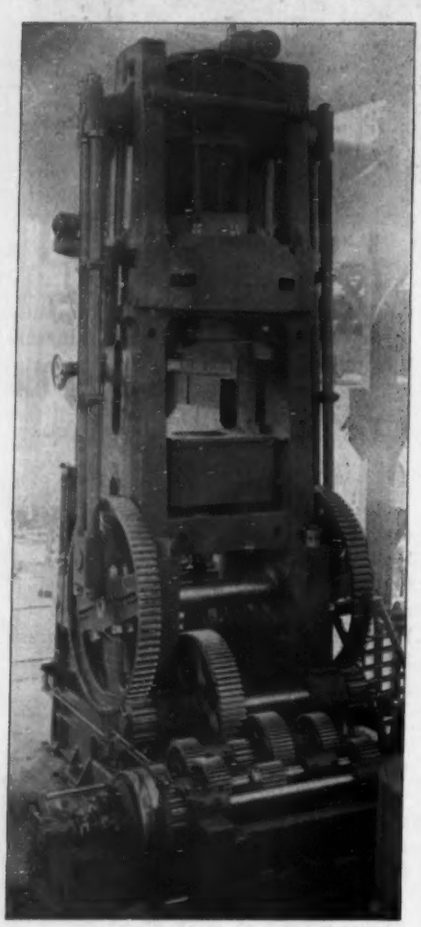


FIG. 3—REAR VIEW OF PRESS SHOWING ARRANGEMENT OF GEARS

Handling Long Rods in Bundles

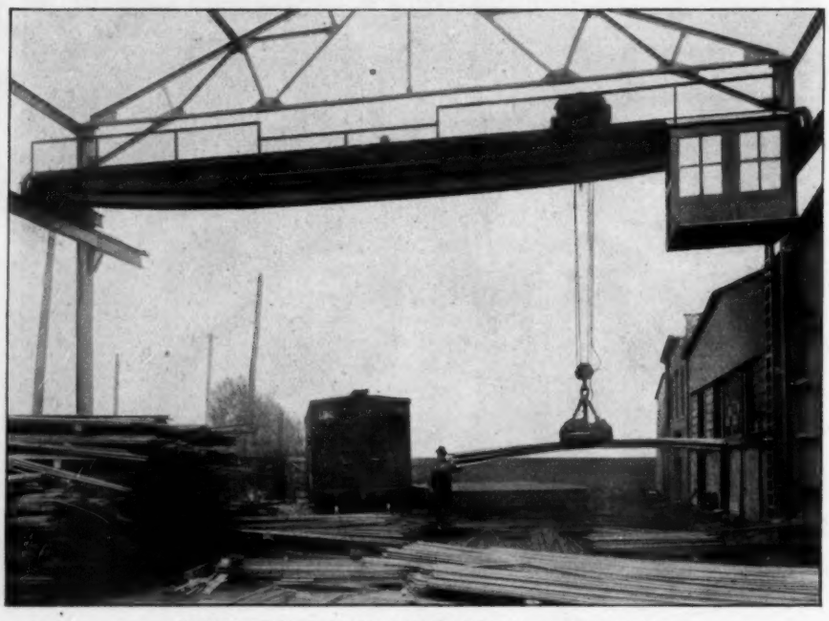
In the recent installation of a Shaw electric crane at the plant of the Bayonne Bolt & Nut Co. of Bayonne, N. J., there is an illustration of the manner in which a certain problem of handling material was solved by the application of a few small strands of wire. The Bayonne company receives large quantities of iron rods about 20 feet in length, and ranging in diameter from ¼in. upward. This raw material which comes in gondola cars on the company's private switches must be unloaded and piled in racks.

Unloading and stacking the rods by hand was, however, a slow process. They had to be lifted, one at a time, from the cars and carried to various parts of the yard. From the flexible and yielding nature of the material the placing of a shipment was necessarily slow and expensive.

In seeking a better way to do the work, an electric crane and magnet naturally suggested themselves, but the nature of the material to be handled again interposed an obstacle. With the rods lying loosely in the bottom of the car a hoisting magnet could not pick up a clean load. Some rods would hang and swing. To obviate this, the expedient of having the consigners wire the rods together in bundles of approximately a dozen, the size varying with the diameter, was adopted. With the rods in bundles the profitable use of an electric crane and a magnet became feasible and the apparatus was installed by the Shaw Electric Crane Co., New York. With the bar stock in bundles the magnet makes a clean lift, not merely of one but of several bundles up to its total lifting capacity.

They are raised out of the car and piled practically at one operation. With the crane and magnet, the company can now accomplish in a few minutes, work which formerly took a gang of freight handlers hours to do. In addition to the saving in labor, there is a gain in the speed of handling raw material. Furthermore, the use of the crane permits piling the rods to a greater height than would have been economically possible by hand work.

Officials of the Woodward Ore Co., Birmingham, Ala., have filed papers increasing the capital stock of the company from $2,000 to $100,000. This is not the Woodward Iron Co., as has been reported, and which is one of the largest iron operators in Alabama.



SHAW CRANE HANDLING BUNDLES OF RODS

A Machine for Testing Gears

Description of a Device Designed to Determine Strength of Gear Teeth of Various Forms Under Actual Working Conditions

BY WILFRED LEWIS

THE GEAR testing machine, shown in Fig. 1, is the result of the writer's efforts to realize in concrete form an ideal machine for the purpose of continuing the experiments of Prof. Guido H. Marx. The possibility of testing heavier gears at higher speeds with comparatively little power occurred at once to Ralph E. Flanders and to the writer, but the problem remained to design a suitable machine which might also be used to supplement the experiments made by the committee on standards for involute gears to determine the friction losses and the running qualities of various types of gearing. After making a number of preliminary sketches the writer was about to put them in the hands of a draftsman, when he had the good fortune to meet Prof. E. P. Lesley, one of Professor Marx's associates, who accepted the task of preparing the working drawing. The machine as it now appears is due in large measure to his careful attention and skill in the perfection of every detail and the writer is pleased to acknowledge many helpful suggestions which have broadened the scope of the undertaking and made the design a practical possibility.

The machine proposed is based essentially upon the principle of the machine used in testing by the committee on involute gears, which is to put the teeth under a working load without consuming an excessive amount of power. The design, however, has been modified to facilitate changes in the working load and in the test gears employed. At the suggestion of Professor Lesley, it has also become possible, not only to change the amount of the working load while running, but also to change its direction, thus producing the effect of reversing loads upon the teeth while running continuously in the same direction.

The apparatus has a hollow shaft made in two parts, A_1 and A_2, united by a clamp A_3, also made in two parts to facilitate assembling. At one end of this hollow shaft is a flange to receive the steel gear ring G, which serves as a permanent part of the apparatus and is strong enough to resist the stresses due to testing.

Besides the hollow shaft A, there are two solid shafts C and S on which are mounted the gears or pinions to be tested. Shaft S passes through hollow shaft A and has a flange, at one end of which is mounted tests gear T. Shaft C, parallel with shafts A and S, carries the wide-faced pinion P, which is in mesh with both the permanent gear ring G and test gear T.

Shafts A and S are connected at their opposite ends by a novel device through which any desired amount of load in either direction can be applied to the teeth, whether at rest or while running in either direction. To accomplish this purpose, the hollow shaft A is flanged to receive the pneumatic cylinder M, in which is the piston N, firmly secured to the shaft S. Pins D D are driven into the piston N through the openings in the cylinder M and upon the projecting ends of these pins rollers R R are mounted upon roller bearings. A bolt passing through the pins, piston and shaft secures the whole in place. These rollers R R engage helical segments H H let into the walls of the cylinder M. Air pressure can be applied to the piston N on either side to give a slight amount of end motion to the shaft S and so, through the action of the rollers upon the helical segments, a slight angular motion is produced between shafts A and S, resulting in a pressure between the teeth of the gears upon these shafts and the teeth of the pinion on shaft C. Pressure gages O_1 O_2 connecting with each side of the piston area are calibrated to record the resulting pressure on the gear teeth, taking account of the piston areas, the pitch of the helical cams H and the diameter of the gear wheels.

Since but little power is required to drive the apparatus, the pinion P is simply clamped to the shaft C, by a nut on its tapered end. The shaft itself is made heavy for sake of stiffness and a pulley O, between bearings, is attached for driving from a countershaft, or if preferred, a motor drive may be used in connection with the extended end. When the gear wheel T is to be tested, the intention is to use it in connection with a steel pinion; and when the pinion P is to be tested, the intention is to make it of cast iron and cut down the width of the teeth engaging with T, by nicking down on either side to a smaller width of face

When a tooth breaks in the wheel T, or in the pinion P, it is important, to avoid the complete destruction of the apparatus by the jamming of the remaining teeth on their ends, to maintain the wheels G and T in proper relation to each other, and for this reason, the stops K K, with their adjustable eccentrics E E, are employed. The block K is clamped to the wheel G

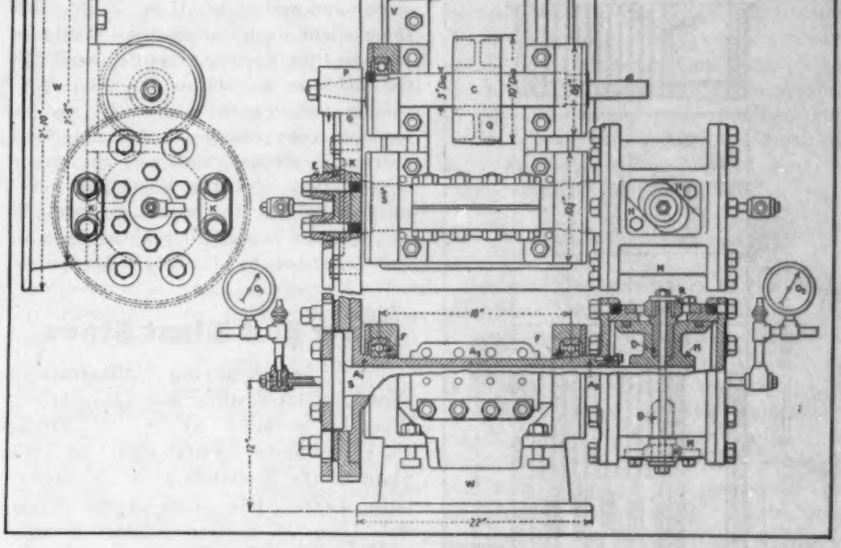


FIG. 1—DESIGN FOR GEAR TESTING MACHINE

Paper presented at spring meeting of American Society of Mechanical Engineers at St. Paul, June 16-19.

through the intervening eccentric bushings *E E*. The intention is to keep one of the clamping bolts tight while the other is loosened and the eccentric adjusted to a predetermined amount of clearance on either side, after which both eccentrics are to be clamped. These stops do not come into action unless a tooth is broken or deformed. Then they cause both gears, *G* and *T*, to run together. By means of these stops it is also possible to study the effect of a predetermined irregularity in forming or spacing the teeth. For instance, an abnormally wide space or tooth can be simulated, when broken out or purposely cut away, by the position

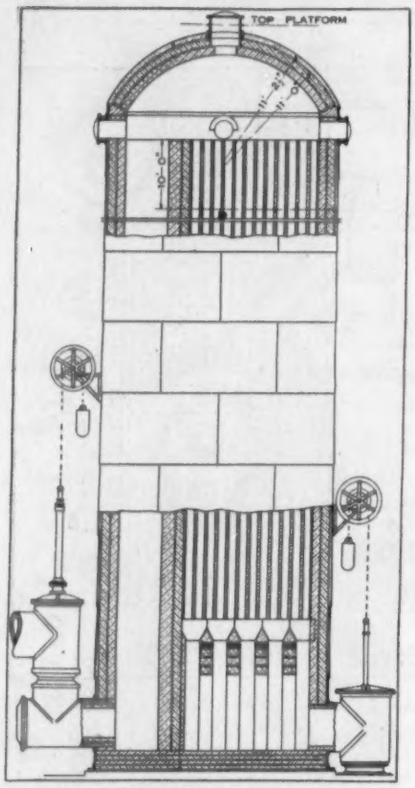


FIG. 1—VERTICAL SECTION OF HOT BLAST STOVES AT ROCKDALE

of the stops and the pounding effect in running will be evident as the result of a certain measured irregularity.

The shafts *A* and *C* are mounted in ball bearings to reduce friction and as a matter of expediency the scale of the apparatus has been determined by the bearings *F F* on the shaft *A*. These are of the largest commercial size and to make them available the shaft *A* was cut in two and united by the clamp A_1. The bearings for the hollow shaft are firmly bolted and doweled to a bed plate *W*, while those for the pinion shaft are adjustable to the diameter of the pinion used, a distance piece *V* of proper width being used in every case to prevent movement under load.

It will be seen that the apparatus is capable of determining to a nice degree of accuracy a number of unsettled problems of great practical importance at a very small expenditure for wear and tear and power. Jigs will be made for drilling the gears *G* and *T* after cutting the teeth, so that the relative positions of the two wheels may be accurately fixed. Friction is practically eliminated in the ball and roller bearings, and what remains must become inappreciable under the well-known influence of vibration when running, except that due to air resistance and the friction in the teeth. With some accurate means for measuring the power consumed, both of these variables can be determined better than ever before. The apparatus in skillful hands should therefore solve the mooted question of the effect of speed on strength, and questions of durability, wear and noise can be studied at a small outlay in power and materials. It is possible that some slight modifications may finally be embodied to facilitate construction, but the machine so shown is believed to contain the elements needed for an exhaustive examination of the subject of gearing in all its phases and the writer hopes it will appeal to some one interested, who has the means to build it and time to experiment on the lines so well indicated by Professor Marx.

New Hot Blast Stove

The accompanying illustrations show an interesting hot blast stove, recently installed by A. F. Plock, Park building, Pittsburgh, at the plant of the Rockdale Iron Co., Rockdale, Tenn. The plant of the Rockdale Iron Co. includes a blast furnace 55 feet high and 12½ feet in diameter at the bosh, which was built in 1890. It is used for manufacturing ferro-phosphate. Until recently two old iron pipe stoves were used to heat the blast, but they did not give sufficient temperature, and therefore the new stoves were substituted.

They are of the two-pass or side combustion chamber type, originally designed by White & Kernan, and are 80 feet high and 20 feet in diameter. The arches extend across the whole inner diameter of the stove, leaving a very large unobstructed lower chamber. There are no small piers with cast iron casings, which are sometimes cut away by the action of the cold blast. The arches are braced laterally by keys or brace bricks.

The arrangement of the girder tiles is shown in Fig. 2. The girders are formed with inclined ends, which bear on corresponding blocks set on the arch walls. They are separated by triangular facing blocks. The latter are so arranged that they form pockets for the ends of the girder tiles. Should any girder tile become cracked or broken, the weight of the checkers would tend to bring the crack together and prevent the girder from falling out. This is due to the incline facings on which the tiles rest.

The checker bricks are shaped something like the briquettes which are used in cement testing. They are laid in various ways so as to form a rigidly bonded mass of brick work, which is not liable to expand or contract out of shape.

At the present time there are nine stoves of this type in service at the Lucy furnaces of the Carnegie Steel Co. at Pittsburgh. The Carnegie Steel Co. also has six White & Kernan stoves in operation at its Isabelle furnaces at Etna, Pa. The American Steel & Wire Co. has two stoves in operation at the Neville Island plant in Allegheny county, Pa.

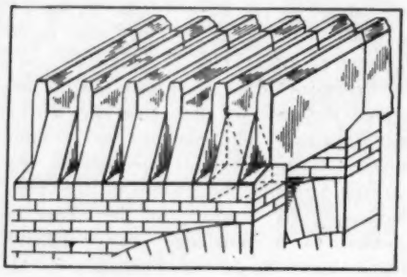


FIG. 2 — ARRANGEMENT OF GIRDER TILES IN STOVE

German Bending Machine

The Wiener Machinery Co., 50 Church street, New York City, has been appointed sales agent for a line of machines of German design for bending angles, beams, channels,, flats, rounds, squares and other shapes. With these machines, it is said, true rings can be bent of angles with legs inward or outward. It only is necessary to heat the ends of the bar or section and bend it by hand in order that it may be passed beneath the rolls. The machines are also adapted for bending standard or girder rails.

The Chambersburg Engineering Co., Chambersburg, Pa., has issued a very attractive calendar for the years 1914-1915. It illustrates a large steam drop hammer which was built by this concern and also shows a single frame steam hammer and a board drop hammer. The calendar is conveniently arranged and any shop man will find it of interest and service.

Getting the Laborer's Viewpoint

How Young Engineers Are Brought Into Contact With Workingmen Through Industrial Service

BY JOSEPH W ROE

IN THE WINTER of 1907-1908 some engineering students of the Sheffield Scientific School at Yale started on their own initiative an activity which for want of a better name has been called industrial service work. It consisted of a study of welfare activities, living and working conditions in American industries, and a definite attempt to render some useful service to working men in the city. As a large industrial center, New Haven has many thousands whose greatest need is a knowledge of the English language. It was felt that to help meet this need was the most practical service the students could render. A system of instruction in English was evolved, based on the familiar phases of every-day life, which did not require a knowledge of the foreign language on the part of the teacher. Groups were organized in various parts of the city wherever they could be gathered, the general plan being that the students should go to the men rather than to attempt bringing the men to any school or institutional buildings. The plan worked well from the start. The classes were full and many newly arrived immigrants were reached who would not have come near a public night school.

In connection with this teaching work, which was the main activity, a series of talks on industrial subjects was given to the students by such speakers as John F. Stevens, of the Panama canal; S. B. Thorne, of the Buck Run Coal Co.; Charles Stelzle. Miss Gertrude Beeks, Prof. Edward A. Steiner, Charles R. Towson, and others. A small library on immigration and industrial conditions was set at work and some of the books became well worn.

A New Attitude

The hold which this work took on the better type of student as well as its effect on him were interesting and significant. The work was wholly voluntary, yet many gave two or more evenings a week throughout the whole winter to it. The word "mucker" dropped from their vocabulary. The "wop", the "hunkie" and the "dago" became people, acquired names and sometimes commanded genuine respect. Student and workmen were coming, often for the first time, into direct and friendly contact and finding out for themselves how the other lived, worked and thought. From the knowledge so gained, there came an attitude of frank good will and friendliness on the part of both.

The following winter a number of other engineering schools undertook a similar work with similar success. Under the leadership of the industrial and student departments of the Y. M. C. A. it has spread rapidly throughout the country until now, only seven years later, more than 3,000 students are engaged in it and are coming into contact with about 50,000 workmen.

In a general way the activities of the student are: (*a*) reading and investigation of the general principles involved; and (*b*) a personal contact with workmen in some line of service. The latter takes many forms, but chiefly that of teaching. In all industrial centers there is a large number of men whose greatest need is English. Without it they cannot get a job alone, buy their own supplies, understand instructions for their work or even for their own personal safety; hence the padrone and labor contractor. With English, an opportunity of becoming industrially independent is opened up to them. Other subjects, of course, are taught, such as first aid to the injured, elementary mathematics, drawing and civics; but English is the greatest need.

The service is not, however, confined to instruction nor to foreigners. Any sound basis of contact is utilized. The classes or groups are kept small, not over five or six men to a teacher, in order to insure the element of personal contact. The work is done independently of the college curriculum, on a voluntary basis, and without pay, as this basis is by far the best in its effect on the student. In some cases the faculty has co-operated by taking over that portion of the program relating to speakers and has arranged a course of industrial lectures for all upper classmen. This has been done recently at the Sheffield Scientific School with good success. The advantages of industrial servic work are felt by the employer, the workman, the student, and the community.

Employers, some of whom were at first critical, welcome it for its direct benefit and support it by giving access to the workmen, by furnishing places for teaching and in many cases paying the small necessary expenses. They see, too, its effect on the student. An employer recently said: "Two college men of equal training worked in my shop last summer. One of them 'knew it all', was despised by the men and got fired. The other became 'one of the men' and learned from them, and nearly every evening some of the working men went to his room and he helped them in mathematics, mechanics, plain reading, etc. That fellow has a big job awaiting him, because he has learned how to handle men to his advantage."

A Mutual Understanding

Some of the advantages to the workman have been pointed out above. He is given nothing which pauperizes him or lowers his self-respect. Usually he is suspicious at first of the student as a representative of the capitalistic class. He finds, however, by contact which he has in almost no other way, that these boys at least are clean-cut, fair-minded and friendly. Those who are familiar with the attitude of workmen know their latent feeling of contempt for the young college engineer who comes among them, possibly strong in things which they little appreciate, but weak in practical things, where they are strong. We have all seen, however, the loyalty with which old, hard-headed workmen will serve young college men who have *won their confidence* and made good with them. Their distrust gives way to a feeling of pride in their successes such as they might have for their own sons who have been given advantages they themselves have not had. This change in attitude of the workman has been clearly marked, and shows a breaking down of social antagonism—a help to all.

The gain to the student, while not obvious, is quite as great. More than half the value of an executive engineer lies in his capacity to understand and work with his men. No amount of technical proficiency can make up for the absence of it. One of the

A paper presented at the spring meeting of the American Society of Mechanical Engineers at St. Paul, June 16-19. The author, Prof. Roe, of Sheffield Scientific School, was the originator of industrial service work for student engineers.

strongest criticisms of the college-trained engineer is the unconscious attitude of assumed superiority which he often has, for a time at least, after graduation. It seriously limits his usefulness and his capacity for learning. The ability to understand and to work with men is the most valuable trait he can have. This our colleges, as colleges, cannot teach, for it is based on a knowledge of human nature and there is no text book on human nature. It can be learned only by personal contact, and genuine personal contact is possible only on a basis of mutual respect and friendliness. The students are learning much more than the possibilities and limitations of welfare work. They are acquiring a personal attitude toward fellow workmen which starts out right.

How it Helped Students

It is possible to give here only a few expressions of how this work is held by students of the stronger type. One says: "It's a wonderful, and sometimes a humiliating revelation to a fellow to get up against some of these foreign men. It just makes a fellow readjust a good deal of his previous thinking." Another, one of the best known college athletes of the day said a few months after graduation: "Remembering what I learned in this movement at Yale, when I became foreman I treated my gang of Italians as men and not as dogs, and it was really pitiful to see the way they returned the little kindnesses I showed them. Each day I was met with cheery words of greeting. When the job was complete, the men came to me in a bunch, thanked me for the fair way I had treated them and said they would like to work for me always." Another, a football captain, said a short time ago: "This industrial work is the livest thing that's struck college since I've been here. It's a real job and it's practical. Everyone of us who goes into it is bound to acquire an experience in dealing with men which the curriculum cannot give, and we need it."

Last year one graduate, who went into the office of a bituminous coal mine, gathered together a class of seven men to prepare them for examinations as fire bosses and underground foremen. With this instruction the men passed the examinations and their potential earning capacity per year was increased an average of $266.40 per man. As a result, this year 40 men applied for similar instruction and as this was beyond his capacity, arrangements were made for paid night instruction in one of the public school buildings which has been carried on by others under his supervision. Without multiplying instances we find results like this wherever men go who have had this industrial service training.

A Service to the Community

The advantage to the community needs but little emphasis. When one considers the type of Americanism with which the immigrant first comes into contact, it is no wonder that his social standards remain low. The only Americans whom many a Pole or Italian meets are saloonkeeper, the wardheeler and the grafter. Contact with clean-cut, wholesome, educated college boys opens up to him a type of Americanism which he sees in no other way. It raises his standards and kindles his ambition. The men come to the students with all sorts of questions which indicate a hunger for information and improvement.

As the industrial service movement has developed it is quite distinct from ordinary social welfare work. It has two clearly defined objectives. The first one is immediate benefit to the laborer whom the student may be teaching; the second, less obvious, but main purpose, is the subjective effect upon the student himself, the developing of an attitude of mind, and a knowledge of the social aspects, the responsibilities, and the opportunities of his engineering profession. While the latter should not be over-emphasized to the student, it is never lost sight of by those directing his activities.

Such, briefly, is the development and nature of industrial service work. In appraising its value it is well to look at it broadly. The work which these students are doing is part of a general trend, of a changing of social standards; and of a development away from the industrial individualism of a hundred years or even fifty years ago. The probability is that this tendency will increase rather than diminish during the coming generation.

Former Industrial Conditions

Industrial history shows nothing more clearly than the fact that while tools of production make high social development and physical welfare possible, they by no means insure them. The series of inventions of Hargreaves, Arkwright, Eli Whitney, Watt, and other great inventors from 1760 to 1800 resulted in a tremendous readjustment of social conditions. In England, where this change was felt first and most severely, tens of thousands of artisans found their handicrafts supplanted. They drifted into the new industrial centers and found work as best they could. The resulting conditions are a matter of history. The industrial leaders had little or no sense of responsibility for conditions of labor and living which would not be tolerated today. Operatives were crowded together under unsanitary and dangerous conditions, working hours were long, and wages were governed solely by the supply and demand of an overcrowded labor market. This indifference on the part of the employers was soon met by violence and industrial warfare. At length, from various reason, conditions began to adjust themselves. Under the leadership of such men as Lord Ashley, Robert Owen, an industrial conscience came into existence, and year by year, partly through labor legislation, partly through labor unions, partly through voluntary improvement by the employers, conditions have steadily improved, and are now better than before the introduction of machinery.

Conditions in America

The situation was never as acute in this country as it was in England, but we know that even today we have in America industries with the most highly developed machinery where child labor and dangerous or unsanitary working conditions still exist. While conditions as a whole are by no means ideal, there has come a general acceptance of the fact that reasonable hours, good light and air, safety, and a fair wage are best not only for the worker, but for the employer. Men do not agree, by any means, as to just what constitutes reasonable hours and a fair wage; but none now deny the general principle.

At the beginning of this century a new force came in, the rapidly developing art of industrial management. It is still in its infancy, yet enough has been done to show that old methods of management have been wasteful and that great increases in production are possible when the right methods have been found and put into successful operation. The invention of machinery vastly increased the workman's production by giving him new and efficient tools. The new force opens up a further increase, through the higher efficiency of the workman himself and of methods of industrial management. The effect in both cases is the same. The advent of machinery produced a profound social readjustment accompanied by widespread distress and friction. The readjustments due to the application of improved methods of management will not in all probability be as great, certainly not as drastic. Standards are far higher today than when machinery was first introduced a hundred years ago and workmen now have means of de-

(*Continued on Page* 1148*b*.)

Sheet Metal Contractors Meet

Annual Gathering at Cincinnati Well-Attended—Visits to Mills in Ohio and Kentucky

Sheet metal men from all over the country gathered in Cincinnati last week for the tenth annual convention of the National Association of Sheet Metal Contractors. Approximately 300 delegates were in attendance. The professional sessions of the association were held at the Gibson hotel and at the same time an attractive exhibition of sheet metal products, in which many prominent iron and steel manufacturers were represented, was held at the Cincinnati Music Hall.

The large number of modern sheet mills in the Cincinnati territory made it possible for the local committee to arrange an interesting series of sightseeing trips, and the afternoons during the week were devoted to tours of inspection.

At the opening session, June 16, James A. Daugherty, of Washington, D. C., president of the association, occupied the chair. Addresses of welcome were made by Frederick M. Spiegel, mayor of Cincinnati, and E. W. Edwards, president of the Cincinnati Sheet Metal Club. The latter organization was formed specially to entertain the delegates to the convention.

After the business session on Tuesday the delegates were taken by special train across the Ohio river to Newport, Ky., where the plants of the Andrews Steel Co. and the Newport Rolling Mill Co., both of which are operated by the same management, were inspected. A banquet was served in a park adjoining the plant of the Newport Rolling Mill Co. Following the banquet, short addresses were made by A. L. Andrews, president, and Frank A. Moeschl, manager of sales of the Newport Rolling Mill Co.

The annual outing of the association was held at Coney Island, near Cincinnati, on June 18. The delegates were conveyed to this pleasure resort by boat, and in the evening the annual convention banquet was served at the Coney Island club house.

Trip to Middletown

On June 19, after the final business session and election of officers, the delegates and visitors were taken by a special train to Middletown, O., where the plant of the American Rolling Mill Co. was inspected. A buffet luncheon was served on the train and the visitors were also tendered another luncheon at the plant. After the inspection of the plant, the delegates gathered in the assembly room of the company where talks were given by R. C. Phillips, secretary, and G. H. Charls, manager of sales of the American Rolling Mill Co.

The papers read at the convention included the following: "The Cost of Doing Business", by Edwin L. Seabrook, of Philadelphia, secretary of the association; "Co-operation, the Silent Partner of My Business", by Paul F. Brandstedt, of Washington, D. C.; "Employers' Liability Insurance", by A. O. Jones, of Battle Creek, Mich., and "Discussions of Warm Air Heating", by J. D. Green and Allen Williams, president and secretary, respectively, of the National Warm Air Heating and Ventilating Association.

At the final session on Friday, the following officers were elected for the ensuing year: President, Paul F. Brandstedt, Washington, D. C.; first vice president, John Gereck, St. Louis; second vice president, K. L. Willis, Moline, Ill.; third vice president, T. P. Walsh, San Antonio, Tex.; fourth vice president, James Dalzell, Youngstown, O.; secretary, Edwin L. Seabrook, Philadelphia, re-elected; treasurer, W. A. Fingles, Baltimore, re-elected; trustees, James A. Daugherty, Nashville, Tenn.; H. W. Michaels, Denver, and Griffith Jones, Racine, Wis. Denver was chosen as the next meeting place after a spirited contest with Peoria, Ill.

Large Number of Exhibitors

The following companies were represented at the exhibition: Monroe Foundry & Furnace Co., Monroe, Mich.; R. F. Johnston Paint Co., Cincinnati, O.; The Williamson Heater Co., Cincinnati; The Thomas & Armstrong Co., London, O.; The J. M. Robinson Co., Cincinnati; The Newport Rolling Mill Co., Newport, Ky.; Parker Supply Co., New York; American Sheet & Tin Plate Co., Pittsburgh; F. O. Schoedinger, Columbus, O.; Stark Rolling Mill Co., Middletown, O.; David Lupton Sons Co., Philadelphia; Farquar Furnace Co., Wilmington, O.; Ohio Brass & Copper Co., Cincinnati; Follansbee Bros. Co., Pittsburgh; J. M. & L. A. Osborne, Cleveland; F. Dieckmann Co., Cincinnati; C. G. Hussey Co., Pittsburgh; Economy Furnace Co., Columbus, O.; The Huenefeld Co., Cincinnati; Wooden Ventilator Co., East Palestine, O.; Hisey-Wolf Machine Co., Cincinnati; Gryfon Paint Co., Cincinnati; Danzer Metal Works, Hagerstown, Md.; American Rolling Mill Co., Middletown, O.; Double Blast Mfg. Co., Chicago; Estate Stove Co., Hamilton, O.; National Paint & Varnish Co., Cleveland; Ideal Heating Co., Columbus, O.; Edwards Mfg. Co., Cincinnati, and Cincinnati Fire Proof Door Co., Cincinnati.

Reopening Old Iron Mine

The E. & G. Brooke Iron Co., Birdsboro, has resumed mining at the French Creek iron mine at St. Peters, Chester county, Pa., which has been idle for some years. Ore has not been taken from the mines since 1898, when operations were discontinued, owing to the fact that the ore was difficult to roast to reduce its sulphur content. The ore now will be crushed and desulphurized through sintering. In its natural state, the mineral analyzes about 55 per cent metallic iron. For some months past, the company has been clearing the shaft and underground workings and putting the plant into shape for operations. The French Creek property is owned jointly by the E. & G. Brooke Iron Co. and the Phoenix Iron Works. The Brooke company has leased the holdings of the latter and will use the output of the mine for its blast furnaces at Birdsboro.

Obituaries

Richard E. Hardisty, of the firm of Hardisty & Co., Linwood, Cincinnati, manufacturers of knives and augurs, died last week.

Albert Millard Wiley, long identified with the wholesale hardware trade in Boston, died at his home at Brighton, Mass., June 16. He was born in Boston 62 years ago. After completing his course of high school, he entered the employ of Frye, Phipps & Co., later becoming a member of the firm.

MECHANICAL ENGINEERS

ENGINEERS as a class are developing a new conception of their relation toward the affairs of government, resulting from the gradual awakening of a social consciousness, which is directing them to take a larger share in the administration of public affairs. This new movement in engineering circles received an unusual impetus at the spring meeting of the American Society of Mechanical Engineers, which took place between Tuesday and Friday of last week in St. Paul and Minneapolis. Throughout the entire proceedings the references to the growing public responsibilities of engineers were constant.

Addresses of welcome were made on Tuesday evening by representatives of the City of St. Paul and the Association of Commerce and also by A. O. Eberhardt, governor of Minnesota. In his response to the St. Paul hosts, H. L. Gantt, vice president of the society, who acted in the absence of President Hartness, told how important and essential the engineer's work is considered in Germany and other European countries. Elaborating the principal theme of meeting, he said that it is to the engineer in public service that we must look for the final settlement of our labor problems, because industrial leaders eventually must be guided by facts rather than by opinions and through personal contact with the machinery of production, the capitalists and the workingmen, the engineer alone is acquainted with all the facts.

Another phase in the public responsibilities of the engineer was brought to light at the Wednesday morning session in considering the report of the committee on boiler specifications. The existing legislation on boiler construction is conflicting and in a large measure ineffective in preventing loss of life and property through explosions. Every winter a new batch of ill-advised laws is added to the statute books. It is because engineers have been slow to assert themselves in public matters that this condition exists.

Realizing the situation, the American Society of Mechanical Engineers some time ago appointed a committee to formulate standard specifications for the construction of steam boilers and other pressure vessels and for their care in service. An exhaustive report was presented by the committee at the St. Paul meeting. A number of prominent members of the society and representatives of the leading boiler manufacturers appeared before the meeting and pleaded for early action in order that an approved set of specifications might be ready for the winter legislative season, when at least eight states will pass new boiler inspection laws. Among those who advocated an early adoption of the report were Thomas E. Durban, general manager, Erie City Iron Works, Erie, Pa.; D. S. Jacobus, of the Babcock & Wilcox Co., and John A. Stevens, chairman of the boiler specifications committee.

Another group of members, led by Henry Hess, felt that the report should be given further consideration by a joint committee representing several technical societies.

A National Conference on Boiler Construction

It was finally decided to receive the report conditionally and to hold a hearing to discuss the details of the specifications at the society's rooms in New York, Sept. 15, 1914. At this hearing, suggestions by anyone interested will be welcomed, the only condition being that a brief statement of the points to be covered be filed with the secretary by Aug. 15. It is expected that this hearing will constitute a national conference on boiler construction and that the specifications which result will become a model for all future legislation.

At the close of the Wednesday morning session, Calvin W. Rice, secretary of the society, stated that arrangements were being made to devote a full day at the annual meeting in New York, Dec. 1-4, to a discussion of the relations of the engineer to the public. He also said that up to date, 175 foreign technical societies had officially accepted the joint invitation of the American societies to attend the International Engineering Congress in 1915.

The increasing social and community responsibilities of the engineer were again emphasized in a paper on industrial service work for young engineers, presented at the Wednesday afternoon session by J. W. Roe. This paper, which is published in full elsewhere in this issue, describes a system which has been developed at Yale for bringing undergraduate engineers into personal contact with workingmen in such a way that they can mingle freely and each learn the other's point of view. Discussion of the paper brought forth the opinion that it was a most promising step forward in bringing employers and employes together on a basis of mutual understanding. "It is better," said H. L. Gantt, "to have a superintendent who knows how to handle workmen with a poor system of management than to have a perfect system with a man who does not understand human relations." Other speakers elaborated this idea.

A group of three papers on powdered fuel were read at the Wednesday morning session. One of them, "An Installation for Powdered Coal Fuel in Industrial Furnaces", by William Dalton and W. S. Quigley, is published elsewhere in this issue. Abstracts of the other two papers follow, R. C. Carpenter's paper on burning pulverized coal in the cement in-

MEET IN TWIN CITIES

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dustry being taken up first, followed by F. R. Low's paper on pulverized coal for steam-making.

Prof. Carpenter treats of the development of the process of burning pulverized coal in the Portland cement industry and points out the underlying principles which control the process. He also gives a brief description of the machinery needed for the operation. The requirement of the successful burning of pulverized coal is ability to burn the coal particles while in suspension. The process has always proved inefficient or a failure when the coal particles could not be kept in suspension during the entire process of combustion. This fundamental requirement makes it obvious that to obtain the very best results the coal should be ground very fully and also that the combustion furnace should be of favorable form. The cement rotary kiln is favorable for burning in suspension while the modern boiler furnace is not. The paper describes the rotary kiln, dryers for removing moisture, various forms of pulverizing machines used in the industry and, as an example, a complete outfit for preparing the pulverized coal as adapted for a Portland cement mill. It also gives data as to the cost of pulverizing the coal and the production from the kilns.

F. R. Low states that many attempts have been made to use pulverized coal as a fuel under boilers. Most of these have looked promising, but few have persisted, and a small proportion of the coal used for steam-making is burned in this way. The paper mentions some of the earlier attempts and describes some of the systems upon which present effort is being expended. The proportionately large surface exposed by the finely comminuted fuel for oxidation makes perfect smokeless combustion with a minimum air supply possible. Combustion under such conditions, however, results in an unsupportable furnace temperature. If this is reduced by increasing the excess air, efficiency is sacrificed; if by reducing the amount of fuel fed, capacity is limited.

The over-all advantage of this over the less expensive stoking methods in common use is yet to be proven.

In a written discussion, J. L. Agnew, of the Canadian Copper Co., Copper Cliff, Ont., took up the use of powdered coal in reverberatory furnaces, stating that no great difficulties had been encountered and that no special changes are necessary to the furnace, other than the elimination of the fire box and the introduction of the coal atomizers through the bridge wall, which is bricked up to the roof. Mr. Agnew gave the cost of grinding as 45c per ton. H. G. Barnhurst stated the cost of pulverizing varies from 18c to 24c per ton and A. W. Raymond, of Raymond Bros. Impact Pulverizer Co., Chicago, submitted figures ranging from 11.4c to 24.6c, the former being based on crushing 25 tons per hour. The variation in the cost data submitted is noteworthy.

Standard Specifications for Flanges

The flange committee reported at the Wednesday morning session and submitted a new set of specifications for flanges and flanged fittings. The report was accepted, except that the matter of adopting a name for the new specifications was referred to a joint committee from the A. S. M. E., the National Association of Steam and Hot Water Fitters, the U. S. Department of Engineers and others in interest.

A paper by William Kent, on the classification and heating value of American coals, gave evidence of painstaking research.

Prof. P. F. Walker, of the University of Kansas, in discussing Mr. Kent's paper, said that a simple and direct method of determining the heating value of bituminous coal is not yet in sight and he felt that Mr. Kent's results are of more value negatively than positively.

A design for a gear-testing machine, which is the result of considerable experimental work, was presented by Wilfred Lewis. Mr. Lewis' paper is published in full elsewhere in this issue. The discussion of the paper resulted in the passage of a resolution suggesting that the council of the A. S. M. E. take steps to provide funds for further practical research along the pathways pioneered by Mr. Lewis largely at his own expense.

The concluding professional session on Thursday was held in the new engineering building at the University of Minnesota and the proceedings were opened by appropriate remarks by Fred B. Snyder, regent, and Henry T. Eddy, dean of the graduate school. At this session it was announced that James Hartness, president of the society, had been given an honorary M. A. degree by Yale in recognition of his distinguished services as an engineer of public consequence.

In addition to the papers mentioned above, the following were contributed to the proceedings of the spring meeting: "A Flow Metering Apparatus", by A. M. Levin; "The Railroad Track Scale", by W. Wallace Boyd; "Handling Coal at the Head of the Great Lakes", by G. H. Hutchinson; "Minneapolis Flour Milling", by Charles A. Lang, and "Power Development at the High Dam Between Minneapolis and St. Paul", by Adolph Meyer.

The social features of the meeting were fully as enjoyable as usual. It was the first meeting of the society in the northwest and a special effort was put forth by the local contingent to make everyone feel thoroughly at home. A reception and dance followed the opening session Tuesday evening; new moving pictures of iron ore mining were presented Wednesday evening by John Hearding, superintendent of the Oliver Iron Mining Co.; a luncheon was given in the new engineering laboratory of the University of Minnesota on Thursday and during the professional sessions the ladies were escorted over the twin cities.

On Thursday afternoon and evening the members and their guests were entertained by Mr. Gebhard Bohn at his summer home on Lake Minnetonka.

TIPS FOR NEW BUSINESS

Equipment needs of the Iron and Steel works, Machine shops, Foundries and other Metal Working plants

In New York the improvement in the machinery market, which was noted in last week's issue, is less noticeable at present and the market is dull. No new inquiries of importance have been put out and the business which was reported last week, is still under consideration. The largest prospective purchasers in this territory are the Farrell Foundry & Machine Co., Ansonia, Conn., and the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., which is building a new plant at Easton, Pa. The former concern, it is reported, soon will close for equipment for its new plant at Ansonia, but the purchases will involve considerably smaller requirements than were included on the inquiries originally sent out. The Taylor-Wharton Co., it is understood, has not yet closed for any of the machinery for which it has taken bids during the past month or two. There continues to be some activity in cranes. The government still continues a prospective purchaser, not yet having closed for the cranes to be bought for the Mare Island and Puget Sound navy yards. The second-hand machinery market continues fairly active. Demand from abroad shows no signs of improvement.

At Pittsburgh the machine tool market has failed to reflect further improvement this week. Conditions seemed to be improving a week or 10 days ago, but thus far there has been no definite change in the situation. Inquiries are no more numerous, but some dealers declare that buyers show a greater willingness to close than has been the case during the last few months. Builders of heavy rolling mill machinery, with few exceptions, continue to operate plants at practically maximum capacity, on orders taken some time ago.

The machine tool business in Chicago has not improved as the summer has advanced. Ordinary lines, such as drills, planers, milling machines and similar machines, are extremely dull and such business as is going is confined to special lines such as those used in agricultural implement plants and sheet metal and stamping concerns. The automobile trade apparently is unusually dull and much less business is being done in this line than ordinarily at this season. Railroads are not active in the market and nothing further than single tools now and then appear from that quarter.

At Cincinnati the first half of June has passed without giving indication of improvement in the machine tool industry. Buying on the part of the railroads has been spasmodic and has been limited largely to single tools. The general demand is light. Second-hand machinery is in better demand than new machinery, but sales are far from satisfactory. Small electrical equipment is in fair demand. Special machinery, such as sugar and baking equipment, is not in heavy demand, although manufacturers are busily engaged filling existing contracts.

EASTERN STATES

BOSTON.—The Sanger Mfg. Co. has been incorporated; machinery; $40,000; by Erwin C. Fisher, Isaac Van der Broek.

LYNN, MASS.—The Commonwealth Engineering Co. has been incorporated to engage in the manufacture of gas engines, motor vehicles and aeroplanes; $50,000; by Earl Abrams and Ethel S. Hannum, both of 144 Burrill street, Swampscott; and John B. Cahoon, 67 Middlesex avenue, Swampscott.

ANSONIA, CONN.—As soon as the present building can be torn down, the Farrel Foundry & Machine Co. will erect a brick and steel structure.

BRIDGEPORT, CONN.—The United Metal Works of Bridgeport has been incorporated; $5,000; by Herman Abroms, Alfred E. Woolard and Arthur Woolard, Bridgeport.

BRIDGEPORT, CONN.—The F. C. Sanford Machine Co., which was recently wrecked by fire, incurring a $20,000 loss, will be rebuilt immediately.

DERBY, CONN.—The Birmingham Foundry Co. has purchased a part of the canal basin land on Water street and will build an addition to its plant; Berlin Construction Co. has the contract.

HARTFORD, CONN.—Greenleaf Mfg. Co. has been incorporated; automobile parts; $35,000; by George J. Long, W. H. Greenleaf and John R. Hays, all of Hartford.

SOUTHINGTON, CONN.—Contract for the addition to the plant of the Clark Bros. Bolt Co. has been awarded to Lewis A. Miller of Meriden. Ground has been broken.

AUBURN, N. Y.—The Columbian Rope Co. will erect a 1-story brick addition to its present factory, extra space to be used for a pattern shop.

CHARLOTTE, N. Y.—Purchasing agent of Monroe county, Rochester, will receive bids until Aug. 6 for erecting a bridge across Genesee river at this place; bridge to have movable and fixed spans.

DALTON, N. Y.—The Van Nostrand Mfg. Co. has been incorporated to manufacture implements of husbandry, motors, cutlery and jewelry; $10.000; by G. M. Church, A. E. Holt, G. V. N. Smith, Buffalo.

NEW YORK.—George J. Schnatz Iron Works has been incorporated; $10,000; by H. Frederick, G. J. Schantz, 38 Old Broadway.

NEW YORK.—Safety Fire Door Co. has been incorporated; $50,000; by A. Warshaw, I. & T. Raskin, 1776 Bergen street, Brooklyn.

NEW YORK CITY.—The Berg & Beard Mfg. Co. has been incorporated; railroad ties, farm implements; $50,000; by R. W. Moller, J. W. Beard and C. Berg, 61 Fleet street, Brooklyn.

ROME, N. Y.—The Armour Co. plans to establish a plant here; the building which will be of concrete and fireproof throughout will cost about $40,000.

ALLENTOWN, PA.—Frank Kolb, baker, of Reading, has purchased a building site extending from 214 to 224 Hamilton street, where he will erect a $300,000 bakery plant.

ERIE, PA.—The Skinner Engine Co. will erect a 70 x 90-foot addition to its plant at a cost of about $5,000.

ERIE, PA.—The Lake Shore & Mich. Southern railway has plans to eliminate several grade crossings along the main line in this city; it is estimated that this will bring more than $1,000,000 in new manufacturing plants and reconstruction made necessary by changes in grades.

NEW CASTLE, PA.—The Standard Wire Co. is looking for a site for its proposed 1-story factory building.

PHILADELPHIA.—Erwin & Leighton have begun work on the factory buildings to be eercted for Thomas Jammey at a cost of about $115,000.

PHILADELPHIA.—The Newhall Rolling Mill Co. has been incorporated; $5,000; by David Newhall, Morton L. Newhall, C. C. Pell, city.

PITTSBURGH. — The Auto Sprinkler Equipment Co. has been incorporated $25,000; by H. A. Logue, H. C. Fry Jr. and J. E. Stone, city.

PITTSBURGH.—The Modern Sanitary Co. has been incorporated to manufacture chemicals; $100,000; by H. M. Feely, Henry C. May, Ralph M. Eccles, Henry Anholtzer and D. Lee McConnaughey, all of Pittsburgh.

SCRANTON, PA.—The E. C. Williams Co., Coal Exchange building, city, has the con-

Showing Ayer & Lord Interior Wood Blocks installed in a large steel warehouse. Name on application.

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You have *heard* enough and *seen* enough of Ayer and Lord Interior Wood Blocks to know that they are *just what you require.*

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KANSAS CITY, MO.—1117 Rialto Bldg.
ST. LOUIS, MO.—554 Pierce Bldg.
MEMPHIS, TENN.—1402 Exchange Bldg.
PHILADELPHIA, PA.—
319 Porry Bldg.

tract for the $20,000 addition to Lackawanna Mills plant.

UNIONTOWN, PA.—Bids will be received at the court house until noon, July 8, for furnishing all material and labor for building a reinforced concrete bridge over Georges creek, Fairchance, Pa.; also one over Redstone creek at Grindstone, Pa.

ZELIENOPLE, PA.—Work has begun on the proposed 124 x 324-foot carriage factory for W. C. Laderer.

E. ORANGE, N. J.—Reiss Starter Co. has been incorporated; automobile starters; $200,000; by Charles Reiss, city; W. B. Riley, A. G. Causland, Atlantic City.

HARRISON, N. J.—The General Electric Co. awarded Salmond Bros. Co., Arlington, N. Y., the contract for the proposed 3-story, 80 x 200-foot addition to No. 36 unit of its plant here.

JERSEY CITY, N. J.—The Fink Blower Co. has been incorporated to manufacture machinery; $100,000; by E. H. Geran, A. C. Reeves and F. H. Otto, Jersey City.

NEWARK, N. J.—Boarem Nicholas Motor Car Co. has been incorporated; $100 000; by R. R. Boarem, Morristown; Louis B. Thedand, Brookside; and J. Dykers Nicholas, Bernardsville.

PATERSON, N. J.—The Sipp Mach. Co., manufacturer of silk machinery, is building a $40,000 addition to its plant.

PERTH AMBOY, N. J.—New Era Auto Co. has been incorporated; automobiles; $50,000; by Alexander Conquest, Richard Henderson, Thomas Conquest, Perth Amboy.

DOVER, DEL.—Pittsburgh Automatic Sprinkler Co., Pittsburgh, incorporated to manufacture metal tanks, pipes and apparatus essential to installing a system of fire and corrosive preventative in all heating systems; $300,000; by John T. Morris, E. H. Patterson and Harry C. Curwin, all of Pittsburgh.

BALTIMORE.—The Crown Cork & Seal Co. has asked for bids for a machine shop addition to its Guilford avenue plant; estimated cost, $200,000.

EASTON, MD.—Easton electric commission will receive bids until July 8 for engines, generators, switchboards, boilers, stack, feed water heater, piping and pumps, etc. Reliance Engineer Co., Fourth National Bank building, Cincinnati, O., is engineer.

CENTRAL STATES

AKRON, O.—C. L. Bower will open bids July 8 for reconstructing Hopkins bridge in Bath township; plans with commissioners; certified check for $300 required.

AKRON, O.—C. L. Bower, clerk of board of commissioners, will open bids July 10 substructure and superstructure for the Pleasant Valley bridge over Tuscarawas river south of Brittain; plans with commissioners; certified check for $300 required.

ATHENS, O.—Howard Hannington representing the Ohio Electric Co. states that the company will spend about $1,000,000 in establishing its plant here; it has also offered to buy the Athens electric plant.

BARBERTON, O.—The Standard Motor Co. plans to erect a $15,000 building.

CANTON, O.—The James Mfg. Co. has been incorporated at Columbus by P. R. James et al., capital, $100,000. The company has been known as the Buckeye Tank & Seat Co., operating in Pennsylvania. The capital stock has been doubled and the firm plans to increase the output of the plant; a foundry has already been installed.

CINCINNATI.—Bids will be received at 405 the Custom House, until 2 p. m., July 2, for construction and delivery of 10 steel dump scows; information may be had from H. Jervey, lieutenant colonel of engineers.

CINCINNATI.—The Eagle Mfg. Co., Cincinnati, has increased its capital stock from $50,000 to $100,000 to provide funds for erecting an addition to its brass foundry.

CLEVELAND.—Proposed repair shops to be built by the Cleveland Railway Co. will cost about $1,000,000 according to estimates of its engineer.

CLEVELAND.—Cleveland Metal Products Co. plans to erect an 81 x 191-foot brick and steel building, to cost about $18,000; also a 57 x 81-foot brick and steel foundry building to cost about $6,000.

CLEVELAND.—E. G. Krause, clerk of the board of commissioners, will open bids July 18 for a reinforced concrete arch bridge across Big Creek valley on Pearl road; estimated cost, $600,000; plans with county engineer; bids must be accompanied by certified check for $10,000; copy of plans and specifications sent on receipt of $25.

DAYTON.—Architects Schenck & Williams are drawing plans for the $100,000 power plant to be erected at Springfield by E. L. Shuey of this city.

FOSTORIA, O. — Ohio Light & Power Co. has issued 30-year bonds worth $1,300,000; the larger part of proceeds from which will be used to establish a power plant to furnish power and light to Tiffin, Fremont and this place; Fred W. Sweasy, of Marion, Ind., is general counsel for the company.

MEDINA, O.—The Medina Foundry Co. has increased its capital stock from $75,000 to $150,000.

SPRINGFIELD, O.—A new power house is being designed for the Springfield Street Railway Co., Springfield, O. Power plant equipment will be required.

SPRINGFIELD, O.—Financial arrangements have been authorized for erecting a steel bridge over Buck creek in Betchel avenue; plans will be prepared at once; a single span structure is proposed.

TOLEDO, O.—McCaul Auto Tire Co. has secured a permit to erect a $9,000 factory building at 1353 Miami street.

WEST UNION, O.—Plans are being laid for installing an electric light plant here; work is expected to begin shortly.

PARKERSBURG, W. VA.—This district has voted to issue $175,000 bonds for a bridge across the Ohio at this point.

COVINGTON, KY.—The Covington Multiple Drill Co. has been incorporated; $8,000; by Philip Fosdick, R. K. Le Blond, Cincinnati; and Albert Kern, Covington.

LOUISVILLE, KY.—Major J. C. Oakes, U. S. engineer, will receive bids until noon July 15 for a lift bridge over Louisville-Portland canal at Eighteenth street.

EVANSVILLE, IND.—The International Steel & Iron Construction Co. has issued additional preferred stock amounting to $25,000.

FORT WAYNE, IND.—The Wayne Oil Tank & Pump Co. has increased its capital stock $100,000.

FORT WAYNE, IND.—The General Machine Co., Fort Wayne, Ind., has been incorporated with a capital stock of $3,000 to manufacture auto parts. Among the incorporators are H. F. Smenner, C. W. Schane and R. M. Vesey, all of Fort Wayne.

INDIANAPOLIS.—The Hercules Forge Co. was recently incorporated with a capital of $2,500 to manufacture steel forgings.

MADISON, IND.—The Madison pin factory which burned recently, will be rebuilt at North Vernon.

MONTICELLO, IND.—A. G. Fisher, auditor of White county, will open bids July 7 for ten bridges in various parts of the county.

VALPARAISO, IND.—McGill Metal Co. has been incorporated; $100,000, by James McGill, H. W. Harrold and L. M. Harrold.

VINCENNES, IND.—Williams Machine & Mfg. Co. has been incorporated to conduct a general machine and repair shop; $10 000; by H. M. Williams, city; J. Frank Whyte and O. L. Williams.

WINCHESTER, IND.—Harry F. Wood, auditor of Randolph county, will open bids July 10 for McVey bridge, 16 x 75 feet, and Brosey bridge, 18 x 20 and the Old Wollen Mills bridge; plans with engineer; bonds equal to amount bid are required.

CHAMPAIGN, ILL. — Fitted Steel Sash Co.; incorporated; $45,000; by E. R. Kelso, Arthur Deeman and E. C. English.

CHICAGO.—Kusel & Harris, 30 North La Salle street, are erecting a public garage on Halsted street near Sheriden Road, of brick and steel, 92 x 100 feet, to cost $20,000.

CHICAGO.—Albert J. Fisher, 1950 Irving Park Blvd., has drawn plans for a store and flat building for Frank Ben, 4437 North Crawford avenue, two stories, 46 x 65 feet, containing some structural steel.

CHICAGO.—R. L. Rayburn, 19 South La Salle street, is engineer in charge of plans for a Y. M. C. A. hotel at 810-32 South Wabash avenue. It will be of steel frame with brick, terra cotta and hollow tile, 18 stories, 96 x 166 feet.

CHICAGO.—M. J. Strnad, 2254 South Troy avenue, has bought an acre at Twenty-fourth and Crawford streets on which a structural steel shop and office building are being erected. The structure will be one story, the shop 74 x 115 feet and the office building 30 x 35 feet. It is expected the new plant will be occupied previous to August 1. Equipment has not been bought, but Mr. Strnad plans to install a compressed air system, several cranes, a large punch press and other material for handling and fabricating structural steel.

MACOMB, ILL.—The Macomb Sheet Metal Works has increased its capital from $40,000 to $60,000 and considerable new equipment will be purchased.

PEORIA, ILL.—Meyer Furnace & Supply Co. has been incorporated; furnaces and supplies, $25,000; by D. Meyer and G. Harms.

BATTLE CREEK, MICH.—The United Steel & Wire Co. is making extensive improvements and additions to its plant at Burchard street. Later it intends to rebuild its tinning plant and install modern equipment.

DETROIT.—James Black has taken the general contract for a store building, 57 x 99 feet, ten stories, for David Scott, Grand River and Warner avenues.

DETROIT.—The Lakeside Foundry Co. has been incorporated; $40,000; by William Blanck, A. Russell Keys, Fred Erb and Edward Stephens.

FLINT, MICH.—The Buick Motor Co. is erecting a 3-story 108 x 265-foot fireproof building for its enamel plant; a mono-rail conveying system will be installed, also 15 ovens and two high speed elevators.

GRAND RAPIDS, MICH.—The Grand Rapids Refrigerating Co. is building an addition to its enameling plant and considers plans for additional warehouse capacity.

ASHLAND, WIS.—The lowest bidder for the erection of the new Ashland county court house was the Bailey-Marsh Co., at $103,242.

BAYFIELD, WIS.—The Bay Iron Works has been incorporated; $15,000.

BUTTERNUT, WIS.—Bids for the construction of a new high and graded school for the city of Butternut will be received after June 28. Plans are being drawn by Henry Wildhagen, architect, Ashland, Wis., and include a manual training department.

DODGEVILLE, WIS.—The Mineral Point Public Service Co., supplying Dodgeville with light and power, will erect a 100-foot steel tower at the local sub-station to carry high voltage wires.

KENOSHA, WIS.—The Arneson Foundry Co. is building an addition to its plant which

will be operated as a steel foundry. A converter is being installed.

KENOSHA, WIS.—The Simmons Mfg. Co. is extending its plant by the erection of two large buildings, of brick and steel construction. One building 60 x 200 feet, will contain the gray iron foundry, brass foundry and blacksmith shop, and the other building, 60 x 260 feet, will contain the machine shop, pattern shop and drafting room.

MILWAUKEE, WIS.—The state board of agriculture, Madison, Wis., is making tentative plans for the construction of a number of steel and reinforced concrete buildings at State Fair park, Milwaukee, to replace buildings destroyed by a tornado several weeks ago. J. C. McKenzie, Madison, is secretary.

MILWAUKEE, WIS.—The Franzen Investment Co. has commissioned H. P. Schnetzky & Son, architects, Milwaukee to prepare plans for a $100,000 light manufacturing building, 75 x 136 feet in size, 4-story, of steel and concrete construction, to be erected on East Water street, between Buffalo and Chicago streets. Bids will be taken about July 1.

MILWAUKEE, WIS.—Charles W. Somers, Cleveland, lessee of the Plankinton block, Milwaukee, announces that razing of building for the construction of the first unit of the $5,000,000 construction project on this site will begin July 1 or 15. The building will be a 10-story commercial block, of steel and brick. A. C. Clas, Milwaukee, is the architect.

WEST ALLIS, WIS.—Klug & Smith, engineers, have awarded all contracts for the erection of a new factory for the Standard Separator Co., Milwaukee, on Burnham street. The Worden-Allen Co., Milwaukee, will do all steel and structural work; Consolidated Sheet Metal Co., sheet metal, and Dahlman Construction Co., the general concrete work.

ST. LOUIS.—Girtanner & Daviess Engineering & Contracting Co. has been incorporated; $40,000; by Frederick Girtanner, James A. Daviess and Alexander Girtanner.

CEDAR RAPIDS, IA.—J. Z. Benedict has moved his business here from Farley, Ia., and will erect a factory to manufacture his All-In-One cart.

MINNEAPOLIS, MINN.—The Bemis Bag Co., 606-08-10 Fourth street south, has obtained a permit to erect a 7-story addition to its factory; estimated cost, $65,000.

SOUTHERN STATES

WALTERBORO, S. C.—City will vote July 7 on issuing bonds for constructing water works.

WOODRUFF, S. C.—City will vote July 7 on a $60,000 bond issue for water works and sewer system.

ATLANTA, GA.—The Moline Plow Co., manufacturer of agricultural implements, will establish a large plant here soon.

LA GRANGE, GA.—Ground has been broken for the iron foundry to be erected here. The promoters have secured a charter with a paid capital stock of $5,000 and privilege of increasing it to $100,000.

DALLAS, TEX.—The Gilsonite Construction Co., of St. Louis, has the contract for the $2,500,000 union depot to be erected here. It also has the contract for a $400,000 reinforced concrete cotton shed to be erected at Galveston.

LUFKIN, TEX. — The Martin Wagon Co. has purchased a site on the Houston, East & Western Texas tracks in North Lufkin and will erect a larger plant at an early date.

SAN ANTONIO, TEX.—Gafford Culvert & Machinery Co., has been incorporated to manufacture and sell road machinery, metal culverts, silos, etc.; $25,000; by Earl R. Gafford, Herbert Saxton and E. R. Powell.

SAN ANTONIO, TEX.—Greenville capitalists are financing the $100,000 cotton oil mill which the Texas Refining Co. will build and operate here; F. J. Phillips, of Greenville, is president.

KNOXVILLE, TENN.—The Fair Foundry Co. has purchased the plant of the Dixie Stove & Mfg. Co. and will install the machinery in its own shop; it has also increased its capital stock from $20,000 to $25,000; J. E. Fair, president.

POND CREEK, OKLA.—Pond Creek Elevator Co. has been incorporated; $4,500; by J. W. Wharton, G. W. Holcomb, Pond Creek; and J. H. Moore, Wichita, Kan.

WESTERN STATES

OMAHA, NEB.—The Gordon-Lawless Co., tinware manufacturer, has purchased two lots at Eighth and Dodge streets as a site for a factory.

LARAMIE, WYO.—Board of commissioners will receive bids until July 8 for a 2-span steel bridge over the Laramie river near Bosler, Wyoming; Z. E. Sevison, county engineer.

SALT RIVER, ARIZ.—Bids will be received until July 14 by F. H. Newell, director of the United States Reclamation Service, at Los Angeles, Cal., for one vertical alternating-current generator, also a variable head turbine for the Salt river project.

LOS ANGELES, CAL.—The R. Kelley Machinery Co. has been incorporated; $30,000; by R. Kelley, S. Hagen and A. Levin.

OAKLAND, CAL. — The Shredded Wheat Co., Niagara Falls, N. Y., is making arrangements to erect a $1,000,000 plant in this city.

RICHMOND, CAL.—R. M. Berthold, representing the California Canneries Co., has been sent here to look over sites for the plant the company considers establishing here.

RICHMOND, CAL.—The Palmer Extract Co. is preparing to establish its western branch plant here; it has secured a site on the Southern Pacific right-of-way near Pullman. A 5-story building will be erected.

SAN FRANCISCO.—De Laitte Automatic Gas Machine Co. has been incorporated; gas machines; $250,000; by C. J. Heineman, 1651 Bush street; L. B. De Laitte and I. E. Burks.

TRADE NOTES

CHICAGO.—O. Th. Carpentier, second vice president of the Wemlinger Steel Piling Co., has opened offices for this concern at 836 Monadnock Block.

CHICAGO.—James T. Gardner, Inc., has taken over the second hand locomotive car and railway equipment business of the late J. T. Gardner. Officers are: M. Gardner, president; R. H. Gardner, vice president; A. Talbot, secretary; A. M. Talbot, treasurer. Offices are in the Railway Exchange Building, Chicago.

CLEVELAND.—The Bourne-Fuller Co. will add to the equipment of its power station a 200 kilowatt motor-generator set and switchboard of the General Electric Company manufacture.

INDIANAPOLIS, IND. — The Oakes Pressed Steel Co., maker of light metal stampings of all descriptions, advises that its plant consists of six buildings, making a total of 18,000 square feet of floor space. It is equipped for light metal stampings and drawing work; its tool room and press equipment being of the most modern, it is able to handle very complicated work. It also has case hardening, heat treating and electric spot welding and enameling departments. William H. Oakes is president.

JOHNSTOWN, PA.—The Cambria Steel Co. will install two 500 kilowatt rotary converters and six 175 kilovolt-ampere transformers which have been purchased from the General Electric Company.

MILWAUKEE.—Recent orders taken by The Pawling & Harnischfeger Co., Milwaukee, indicate the wide variety of uses for which cranes are being adapted and include the following: Oregon-Washington Railway & Navigation Co., one 20-ton crane for the new LeGrande shops at Portland, Oregon; Carnegie Steel Co., four 10-ton cranes for its new warehouse at Boston; Chicago, Milwaukee & Puget Sound railroad, one 5-ton gantry crane for yard service at Spokane, Wash.; Chicago & North Western railway, 10-ton yard gantry crane for use in Chicago; Illinois Steel Co., four 10-ton cranes for the new Minneapolis steel warehouse; Marion Steam Shovel Works, Marion, Ind., three 10-ton and one 5-ton heavy service yard cranes for the Michigan Wood Preserving Co., Reed City, Mich., special type crane for handling creosoted ties; Minnesota Steel Co., Duluth, four 10-ton mono-rail hoists, an unusually large capacity for this type of hoist; Northwestern Iron Co., Mayville, Wis., 90-ton crane for handling 60-ton pig iron ladle. Special high speed crane for use with Cutler-Hammer magnet for retrieving pig iron from cooling tank.

NEW YORK, N. Y.—The Globe Ball Bearing Co. has dissolved voluntarily.

PITTSBURGH.—The American Bridge Co. has ordered a 4-ton electric storage battery industrial locomotive from the General Electric Co.

NEW CATALOGS

POWER HAMMERS.—A new motor driven power hammer is illustrated and described in a four-page pamphlet recently issued by Beaudry & Co., 141 Milk street, Boston, Mass. These hammers are designed for a general line of forging and it is said they can be operated at a high rate of speed. They are fitted either with direct or alternating current motors and are built in a number of sizes with rams weighing from 25 to 200 pounds.

VENTILATING APPARATUS. — A comprehensive catalog of 128 6 x 9-inch pages describing modern ventilating, humidifying and air purifying apparatus has been recently issued by the Carrier Air Conditioning Co. of America, 39 Cortlandt street, New York. This catalog fully describes and treats of the application of three types of machines which are used for air washing, cooling and humidity control in public buildings, offices, factories, theaters, hotels, etc. In a very thorough manner the three types of apparatus mentioned above are illustrated and described in the catalog.

PYROMETERS. — An unusually complete catalog of pyrometers has recently been issued by The Brown Instrument Co., Philadelphia. In addition to descriptive matter and illustrations covering various forms of Brown indicating and recording pyrometers, the book includes a large number of illustrations of pyrometer installations in various parts of the country. Some interesting general information regarding the construction of pyrometers and their care in use is also included in the catalog. The printing and typography of this book make an unusually favorable impression.

SPECIAL STEEL CASTINGS.—A 20-page booklet has been issued by the Swedish Crucible Steel Co., Detroit, which is devoted to its line of standard and alloy steel castings. This company specializes in the manufacture of cast steel carbonizing pots and boxes, both circular and square, and is in position to furnish to the trade crucible, converter or electric steel castings. The company operates plants at Detroit and Windsor, Ont., the combined capacity of the two foundries being 50 tons per day. The booklet contains a number of suggestions on carbonizing practice which will prove of value to all engaged in heat treatment work.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery Through Third Quarter.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.90
Basic, Pittsburgh	13.90
Basic, eastern Pa.	14.00
Malleable, Pittsburgh	13.90 to 14.40
Malleable, Chicago	14.00
Malleable, Philadelphia	15.50 to 15.75
Malleable, Buffalo	13.00 to 13.50
No. 1X Philadelphia	15.00 to 15.25
No. 2 foundry, Pittsburgh	13.90 to 14.40
No. 2 foundry, Cleveland	14.25
No. 2 foundry, Ironton	13.50
No. 2 foundry, Chicago	14.00
No. 2X foundry, Philadelphia	14.75 to 15.00
No. 2X foundry, New York	14.50 to 14.75
No. 2X foundry, Buffalo	12.75 to 13.00
No. 2 plain, Philadelphia	14.50 to 14.75
No. 2 plain, New York	14.25 to 14.50
No. 2 plain, Buffalo	13.50 to 13.75
No. 2 southern, Birmingham	10.25 to 10.50
No. 2 southern, Cincinnati	13.50 to 13.75
No. 2 southern, Chicago	14.85 to 15.85
No. 2 southern, Philadelphia	15.00 to 15.25
No. 2 southern, Cleveland	14.85 to 15.35
No. 2 southern, New York	14.75 to 15.00
No. 2 southern, St. Louis	14.50 to 15.00
Virginia, 2X, Philadelphia	15.30
Virginia, 2X, Jersey City	15.85 to 16.10
Virginia, 2X, New Eng., all rail	16.25
Gray forge (eastern Pa.)	13.75 to 14.00
Gray forge, Pittsburgh	13.65
Gray forge, Birmingham	9.25 to 9.75
Silveries, 8 per cent, Cleveland	17.55
Silveries, 5 per cent, Birmingham	12.50
Silveries, 5 per cent, Chicago	16.85
Standard low phos., Phila.	20.50
Lebanon low phos., furnace	17.00 to 17.50
Low phos., Pittsburgh	21.65 to 21.90
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	16.00 to 17.00
Charcoal, Birmingham	25.00
Middlesbrough, No. 3, Phila., ex ship	15.00 to 15.25

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi, non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7 to 8c
Foreign non-Bess., 50 to 65 per ent.	7 to 8c

COKE

(At the ovens.)

Connellsville furnace	$1.75 to 1.85
Connellsville fur. contr	1.85 to 2.00
Connellsville foundry	2.35 to 2.60
Connellsville fdy., contr	2.40 to 2.65
Wise county furnace	1.90 to 2.10
Wise county foundry	2.25 to 2.75
Pocahontas furnace	1.90 to 2.05
Pocahontas foundry	2.25 to 2.40
New River, foundry	2.75 to 3.50
New River, furnace	2.20 to 2.35

FERRO-ALLOYS

Ferro-manganese, Baltimore	$38.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Bess. billets, Pbgh. and Yn.	$19.50 to 20.00
Open-hearth bil., Pbgh. and Yn.	19.50 to 20.00
Open-hearth bil., Phila.	21.90 to 22.40
Bess. sheet bars, Pbgh. and Yn.	20.50 to 21.00
Op.-h'th sh. bars, Pbgh. & Yn.	20.50 to 21.00
Forging billets, Phila.	26.40 to 27.40
Forging billets, Pittsburgh	24.00 to 25.00
Wire rods, Pittsburgh	25.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Light rails, 8 lbs., Pbgh. or Chi.	1.40c
Lgt. rails, 12 lbs., Pbgh. or Chgo.	1.35c
Lgt. rails, 16 to 20 lb., Pbgh. or Chicago	1.30c
Lgt. rails, 25 to 45 lbs., Pbgh. or Chicago	1.25c
Relaying rails, standard, Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect. Pbgh., base	1.50c
Angle bars, st., sections, Chgo.	1.50c
Spikes, railroad, Pbgh	1.40c to 1.45c
Spikes, railroad, Chgo	1.55c
Track bolts, Pbgh	2.00c
Track bolts, Chgo	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.10c to 1.15c
Structural shapes, Chicago	1.28c to 1.33c
Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.28c to 1.33c
Tank plates, Pittsburgh	1.10c to 1.15c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.26c to 1.31c
Bars, soft steel, Pittsburgh	1.10c to 1.15c
Bars, soft steel, Chicago	1.28c to 1.33c
Bars, soft steel, Philadelphia	1.30c
Bars, soft steel, New York	1.31c
Hoops, carloads, Pittsburgh	1.25c

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds, to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11 cents
Baltimore	14½ cents
Cleveland	10 cents
Cincinnati	15 cents
Chicago	18 cents
Minneapolis and St. Paul	32 cents
Denver	67½ cents
St. Louis	22½ cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, plates and shapes	80 cents

Hoops, less carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.10c to 1.15c
Shafting, carloads, Pbgh., disc. contract	66
Shaft'g carloads, Pbgh., prompt,	67
Shaft'g less carl'ds, Pbgh., disc.	63
Bar iron, Chicago	1.05c to 1.10c
Bar iron, Philadelphia	1.20c to 1.25c
Bar iron, New York	1.25c to 1.30c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.25c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish'g mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.80c to 1.90c
No. 28, black, Chicago	1.98c to 2.03c
No. 28, tin mill, black, Pbgh.	1.80c to 1.90c
No. 28, galvanized, Pbgh.	2.75c to 2.85c
No. 28, galvanized, Chgo.	2.88c to 2.93c
No. 10, blue annealed, Pbgh.	1.35c
No. 10, blue annealed, Phila.	1.50c
Tin plate, 100 lb., coke, base	$3.30 to 3.40

IRON AND STEEL PIPE

(Pittsburgh.)

	Black Butt-weld.	Galv. Butt-weld.
Steel, ¾ to 3 inches	80	71½
Iron, ¾ to 2½ inches	70	61
	Lap-weld.	
Steel, 2½ to 6 inches	79	70½

BOILER TUBES

Steel, 3½ to 4½ inches	72
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.50 to 1.55
Wire nails, retailers, Pittsburgh	1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.30 to 1.35
Plain wire, retailers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	1.70 to 1.75
Galvanized wire, retailers, Pbgh.	1.75 to 1.80
Polished staples, Pbgh.	1.50 to 1.55
Galvanized staples, Pbgh.	1.90 to 1.95
Barb wire, painted, jobbers, Pbgh.	1.50 to 1.55
Barb wire, painted, retail'rs, Pbgh.	1.55 to 1.60
Barb wire, galv., retailers, Pbgh.	1.95 to 2.00
Barb wire, galv., jobbers, Pbgh.	1.90 to 1.95

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 10; cut threads, 80 and 5; larger or longer, 75 and 10.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 15; cut, 80 and 10; larger or longer, 75 and 15.

Gimlet and cone point lag or coach screws, 80 and 20.

Hot pressed square, blank or tapped nuts, $6.30 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, C. & T. square, blank or tapped, $6 off; hexagon, blank or tapped, ⅜ inch and larger, $7.20; ½-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh.	1.55c to 1.65c
Structural rivets, Chgo.	1.68c
Boiler rivets, Pbgh.	1.65c to 1.75c
Boiler rivets, Chgo.	1.78c

SCREWS

(New York.)

Lag, gimlet and cone point	80 and 20
Coach, gimlet point	80
Standard jack	70 and 10
Mch., cut thread, flat head	50 and 10
Mach., cut thread, round head	50 and 10 and 10
Mch., cut thread, fillister hd.	40 and 40 and 10
Mch., rolled thread, flat head or round head	80 and 10
Set screws, iron	75 and 10 and 10
Set screws, steel, per cent advance over iron	25
Square head cap screws	70 and 10 and 10
Hexagon head cap screws	70 and 10 and 10
Fillister head cap screws	60 and 10 and 10
Flat head wood screws	10 and 10 and 5
Round head wood screws	10 and 10 and 5

WASHERS

(Discounts, Iron or Steel, to Jobbers, Cleveland.)

⅛-inch	$7.25
¼-inch	7.00
½-inch	7.00
⅝-inch	7.00
¾-inch	7.00

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

TWISTED REINFORCING BARS

(Soft steel, Pittsburgh mill.)

½-inch and larger	1.25c
⅝-inch	1.30c
½-inch	1.35c
⅝-inch	1.50c
¼-inch	1.75c

IRON AND STEEL PRICES

Corrected up to Tuesday noon

TACKS

(New York.)—

	Discount.
American carpet tacks	90 and 20 and 10
American cut tacks	90 and 20 and 10
Railroad tacks	90 and 40
Gimp tacks	90 and 20 and 10
Finishing nails	70

WIRE ROPE

Galvanized, iron and steel	47½ and 2½
Bright, Iron and steel	55 and 2½

TRIANGLE REINFORCING MESH

(Per 100 square feet f. o. b. mill, car loads.)

No. 4, plain	$1.00
No. 4, galvanized	1.12
No. 7, plain	.49
No. 7, galvanized	.55
No. 23, plain	1.69
No. 23, galvanized	1.88
No. 26, plain	1.17
No. 26, galvanized	1.30
No. 27, plain	.96
No. 27, galvanized	1.07
No. 31, plain	2.49
No. 31, galvanized	2.76
No. 35 plain	1.17c
No. 35 galvanized	1.30
No. 39, plain	3.05
No. 39, galvanized	3.38
No. 43, galvanized	1.23
No. 43, plain	1.10

SPIRAL RIVETED PIPE

(Per 100 linear feet, f. o. b. factory.)

4-inch, plain	$ 19.76
4-inch, galvanized	30.74
6-inch, plain	33.05
6-inch, galvanized	49.73
8-inch, plain	43.17
8-inch, galvanized	65.00
10-inch, plain	66.42
10-inch, galvanized	96.15
12-inch, plain	83.75
12-inch, galvanized	118.30
14-inch, plain	99.14
14-inch, galvanized	138.85
16-inch, plain	117.53
16-inch, galvanized	166.58
20-inch, plain	183.79
20-inch, galvanized	248.39
24-inch, plain	219.92
24-inch, galvanized	293.99
30-inch, plain	324.81
30-inch, galvanized	430.64

CAST IRON PIPE

Three to 24 in., Cleveland	$22.35 to 22.80
Four-inch, water, Chicago	26.50
Six to 12 inches, Chicago	24.50
Larger sizes, Chicago	24.00
Six inch, water, New York	20.50 to 21.50
Four-inch, water, Birmingham	21.50
Six-inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.70c to 1.85c
Steel bars, Philadelphia	1.65c to 1.70c
Steel bars, New York	1.80c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, Cincinnati	1.65c to 1.75c
Iron bars, Philadelphia	1.60c to 1.65c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.80c to 1.90c
Shapes and plates, Philadelphia	1.65c to 1.70c
Shapes and plates, New York	1.85c
No. 10 blue ann. sheets, Chgo.	1.85c
No. 10 blue ann. sheets, Cleve.	2.15c
No. 10 blue ann. sheets, Cinci.	1.95c
No. 28 black sheets, Chgo.	2.45c
No. 28 black sheets, Cleveland	2.60c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 galv. sheets, Chgo.	3.45c
No. 28 galv. sheets, Cleveland	3.60c
No. 28 galv. sheets, Cincinnati	3.45c to 3.55c

IRON AND STEEL SCRAP

(Net tons.)

No. 1 railroad wrought Chgo.	$ 9.00 to 9.25
No. 1 railroad wrought, Cleve.	9.50 to 10.00
No. 1 railroad wrought, St. L.	7.75 to 8.00
No. 1 railroad wrought, Cinci.	8.00 to 8.50
No. 2 railroad wrought, Chgo.	8.50 to 8.75
No. 2 railroad wrought, St. L.	7.50 to 7.75
Arch bars and transoms, Chgo.	12.00 to 12.50
Arch bars and transoms, St. L.	11.00 to 11.50
Knuckles, coup. and spr'gs, Chgo.	9.00 to 9.50
Knuckles, coup. and sp'gs, St. L.	9.00 to 9.25
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis	13.00 to 13.50
Steel car axles, Chgo.	12.25 to 12.50
Steel car axles, St. Louis	11.50 to 11.75
Locomotive tires, Chicago	9.75 to 10.00
Locomotive tires, St. Louis	9.00 to 9.50
Cut forge Chicago	8.50 to 8.75
Pipes and flues, Chicago	6.75 to 7.00
Pipes and flues, Cleveland	7.75 to 8.25
Pipes and flues, St. Louis	6.50 to 7.00
No. 1 cast, Chicago	10.00 to 10.50
No. 1 cast, Cleveland	10.00 to 10.50

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley furnaces	1.20
Cincinnati	2.00

No. 1 cast, Cincinnati	$ 9.25 to 9.75
No. 1 cast, St. Louis	10.00 to 10.50
No. 1 busheling, Chicago	7.50 to 7.75
No. 1 busheling, Cleveland	8.50 to 9.00
No. 1 busheling, Cincinnati	6.00 to 6.50
No. 1 busheling, St. Louis	7.50 to 8.00
No. 2 busheling, Chicago	6.00 to 6.25
No. 1 boiler plate, cut, Chgo.	6.50 to 7.00
No. 1 boiler plate, cut, Buffalo	9.00 to 9.50
No. 1 boiler plate, cut, St. L.	6.00 to 6.50
Boiler punchings, Chicago	9.00 to 9.25
Cast borings, Chicago	4.75 to 5.25
Cast borings, Cleveland	6.00 to 6.25
Cast borings, Cincinnati	4.25 to 4.75
Cast borings, St. Louis	4.00 to 4.50
Machine shop turnings, Chgo.	5.25 to 5.50
Machine shop turnings, Cleve.	5.50 to 5.75
Machine shop turnings, Cinci.	4.50 to 5.00
Machine shop turnings, St. L.	4.50 to 5.00
Malleable, agl.	7.75 to 8.25
Malleable, agricultural, St. Louis	7.25 to 7.50
Malleable, railroad, Chicago	8.75 to 9.25
Malleable, railroad, Cincinnati	6.50 to 7.00
Malleable, railroad, St. Louis	8.00 to 8.25
Angle bars, iron, Chgo.	11.75 to 12.25
Angle bars, iron, St. Louis	10.00 to 10.50
Angle bars, steel, Chgo.	8.25 to 8.75
Angle bars, steel, St. Louis	9.00 to 9.50
Stove plate, Chicago	8.75 to 9.25
Stove plate, Cleveland	7.75 to 8.00
Stove plate, Buffalo	9.75 to 10.00
Stove plate, Cincinnati	6.75 to 7.25
Stove plate, St. Louis	7.50 to 8.00
Bundled sheet, Cincinnati	4.75 to 5.25
Wrought iron pil'g plates, Clev.	13.00

(Gross Tons.)

Heavy melting steel, Pbgh.	$12.00
Heavy melting steel, Buffalo	10.00 to 10.50
Heavy melting steel, Chicago	9.75 to 10.00
Heavy melting steel, Cleveland	10.25 to 10.75
Heavy melting steel, Cincinnati	9.00 to 9.50
H'vy melting steel, eastern Pa.	10.50 to 11.00
Heavy melting steel, New York	8.50 to 8.75
Heavy melting steel, St. Louis	11.00 to 11.50
Bundled sheet, Buffalo	6.25 to 6.50
Grate bars, Buffalo	9.50 to 10.00
Grate bars, New York	5.75 to 6.00
No. 1 railroad wr'ght, east. Pa.	12.50 to 12.75
No. 1 railroad wrought, Pbgh.	11.50 to 12.00
No. 1 R. R. wght., New York	10.25 to 10.50
No. 1 R. R. wrought, Buffalo	11.00 to 11.50
Shafting, New York	12.00 to 12.50
Pipes and flues, New York	8.00 to 8.25
Pipes and flues, eastern Pa.	9.25 to 9.75
Mch. shop turnings, New York	5.75 to 6.00
Machine shop turnings, Buffalo	5.50 to 6.00
Mch. shop turnings, Pbgh.	7.75 to 8.00
Mch. shop turnings, eastern Pa.	7.50 to 8.00
Cast borings, New York	5.75 to 6.00
Cast borings, eastern Pa.	8.00 to 8.50
Cast borings, Buffalo	6.00 to 6.50
Cast borings, Pittsburgh	8.00 to 8.25
Stove plate, (Jersey points)	8.50 to 8.75
Stove plate, Pittsburgh	10.00 to 10.25
Stove plate, eastern Pa.	8.50 to 9.00
Shoveling steel, Chicago	9.25 to 9.50
Shoveling steel, St. Louis	9.00 to 9.50
Reroll'g rails, 5 ft. & ov., Pbgh.	13.00 to 13.25
Reroll. rails, 5 ft. and ov., Chgo.	11.25 to 11.75
Reroll. rails, 5 ft. and ov., Cleve.	11.00 to 11.50
Reroll. rails, 5 ft. & ov., E. Pa.	12.25 to 12.75
Reroll. rails, 5 ft. and ov., St. L.	12.00 to 12.50
Steel rails, short, Chicago	10.50 to 10.75
Steel rails, short, Cleveland	13.00 to 13.25
Steel rails, short, eastern Pa.	11.00 to 11.25
Steel rails, short, St. Louis	11.50 to 12.00
Iron rails, Cleveland	13.50 to 14.00
Iron rails, Cincinnati	10.50 to 11.00
Iron rails, eastern Pa.	15.00 to 16.00
Iron rails, St. Louis	12.00 to 12.25
Frogs, switches, guards, Chgo.	9.75 to 10.00
Frogs, swftches and g'rds, St. L.	10.25 to 10.50
Car wheels, (iron), Pittsburgh	11.25 to 11.50
Car wheels, (steel), Pittsburgh	12.25 to 12.50
Car wheels, Chicago	11.25 to 11.50
Car wheels, eastern Pa.	11.25 to 11.50
Car wheels, Buffalo	12.00 to 12.50
Car wheels, N. J. points	10.50 to 11.00
Car wheels, St. Louis	11.00 to 11.25
Iron axles, Pittsburgh	22.00 to 22.50
Iron axles, Cincinnati	19.00 to 20.00
Iron axles, eastern Pa.	20.00 to 21.00
Iron axles, Buffalo	21.50 to 22.00
Iron axles, Chicago	19.00 to 19.50
Steel car axles, New York	12.25 to 12.75
Steel car axles, Buffalo	15.00 to 15.50
Steel car axles, Cleveland	14.00 to 16.00
Steel car axles, eastern Pa.	14.00 to 14.50
No. 1 busheling, Buffalo	8.50 to 9.00
No. 1 busheling, Pittsburgh	10.00 to 10.25
No. 2 busheling, Buffalo	6.00 to 6.50
Low phosphorus steel, Buffalo	15.00 to 15.50
Low phosphorus steel, Pbgh.	14.00 to 14.25
Low phos. steel, eastern Pa.	14.50 to 15.00
No. 1 forge, eastern Pa.	8.50 to 9.00
No. 1 cast, eastern Pa.	12.00 to 12.50
No. 1 cast, Pittsburgh	12.00 to 12.25
No. 1 heavy cast (N. J. points)	11.50 to 11.75
Boiler plate, Cleveland	8.50 to 9.00
Mall. iron, agricul., Cleveland	9.00 to 9.50
Mall. iron R. R. Cleveland	10.75 to 11.25
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Malleable R. R. Buffalo	10.75 to 11.25
Mall., R. R. east. Pa.	9.00 to 9.50
Bundled sheet, Pittsburgh	8.50 to 8.75
Bundled sheet, Cleveland	7.50 to 8.00

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Standard files	80 and 5
Heavy hammers, 3 to 5 lb.	80 and 10
Heavy hammers, over 5 lb.	80 and 5
Gas pliers, 7-inch, per dozen	$2.00
Gas pliers, 12-inch, per dozen	3.50
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Wrenches, Alligator, discount	75 and 80
Wrenches, drop forged S.	50 and 10

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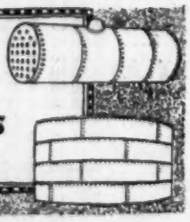
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How Large Structures Are Moved

(*Continued from page* 1127)

told of the manner in which a building owned by the Glenns Falls Insurance Co., Glenns Falls, N. Y., was moved across the street. The building is 60 x 105 feet, three stories high, and weighs 2,600 tons. Methods employed in moving the Glenwood bridge of the Pittsburgh Railways Co., at Pittsburgh, also were outlined.

Getting the Laborer's Viewpoint

(*Continued from page* 1140)

fense. Moreover, the social changes possible are probably not as radical or far reaching as in the earlier development.

The development and application of the highest types of industrial management, however, is going to be difficult and delicate work, if the results are to be made a permanent benefit to society as a whole. Those who personally direct this development will largely determine the efficiency with which "efficiency" itself is applied. If the attempt is made by those in charge to seize all the benefit of the improved methods and to crowd the advantage of the employer they will either defeat or indefinitely postpone the advance. They must be experienced men, wise, fair, thoroughly conversant with possibilities, and free from sentimental idealism. This means not only a knowledge of machinery, systems and time study, *but of human nature, and the rights and real needs of industrial workers.*

The Engineer as an Executive

The executive engineer will be at the focus of this situation. He alone is in direct personal contact with the two great elements involved, capital and labor. His thorough understanding of both of these forces will prove one of the greatest elements in progress. If the man in actual charge has little knowledge of, or sympathy with, the workman, serious mis-steps are certain. If, on the other hand, to a thorough technical training and knowledge of the resources and responsibilities of the employer, he adds an attitude of fairness and friendliness, and a personal understanding of the workman involved, the new force will work out to the good of all concerned. Scientific management offers an opportunity to pay better wages, but it will require strength and wisdom to apportion the economic gain fairly, and to maintain a just distribution of it.

Welfare work in various forms has been going on for many years, ranging all the way from improvement in the small details of working conditions to the planning and building of whole model cities. Some of these enterprises, conceived in a spirit of genuine good will, have met with no response from the workmen and in spite of the great sums of money and much thought spent on them, have ended in bitterness and disappointment. In other cases welfare work has been developed quietly and wisely, each move being tested out as it was tried and has deeply influenced the lives and social standards of the whole community. In the record of these enterprises there is a glaring discrepancy of success and failure. Most of the failures have gone onto the rocks from violation of the fundamental principles of human nature. About some there has been a fine flavor of condescension; others have been made an advertisement; others have been imposed upon workmen by authority. A workman, no matter how crude his social standards, has a right to his own personality and sooner or later he will assert it. As one of their leaders put it to the writer: "Some of these employers roll their good intentions into

a big bolus and jam it down the workmen's throats, saying, 'Here, take that; it's good for you.'" No welfare work will ever be effective unless it is preceded by a square deal, is wrought out gradually and patiently, and is the product of mutual confidence, experience and good sense.

While thousands have been invested in welfare enterprises, we know that the purpose behind them is being accomplished in scores of industrial organizations, without any special equipment, by the personal influence of some man or men in charge. These men seem to have a genius for understanding and developing the best in the men under them. They have no fixed rule or system. It is a question of attitude and personality. They create an atmosphere of confidence instead of suspicion and distrust. Their influence permeates a whole factory, kindling ambition and developing better workmen and better industrial conditions. Such men can accomplish wonders without any welfare equipment. Given a welfare equipment, they make it successful and beneficial to all. Their value to the employer, to the workman, and to the community can hardly be over-estimated; the new art of management under the direction of such men as these will prove a permanent success. The development of just such men as these is the aim of the industrial service movement.

We have tried to sketch briefly the spirit of this movement, its main activities, and its relation to the general industrial situation. It seems sound. There are at present about 30,000 students in the engineering courses of the various schools and colleges throughout the United States. Of these, perhaps 5,000 to 7,000 graduates each year. About 20 to 25 per cent of the students become enough interested in this work to get the benefits of it. What will it mean to the employer and workman in the next generation to have coming into the management of industrial enterprises 1,000 or 2,000 men a year who inspire good will and confidence and have the right point of view from the start?

So far the industrial service work has been guided by experts from the industrial and student department of the international committee of the Y. M. C. A. These men have given it special study and have directed its activities. They have kept it free from fads and its rapid growth is perhaps the best evidence of the wisdom with which it has been directed. Although the motive which lay behind it was a religious one, it has attracted many men who took but little interest in the ordinary forms of religious activities. Many of these have found in the progress of this work that this motive and the unselfish social one are not so far apart.

Greatest Coke Production

All records in coke production were broken in 1913, according to a statement by Edward W. Parker, of the United States geological survey, the output being 46,311,369 short tons, valued at $128,951,430. This is an increase over the 1912 output of 2,327,770 tons in quantity and $17,146,317 in value. Of the 1913 production 33,596,669 tons was made in beehive ovens and 12,714,700 tons, or 27.4 per cent, in retort or distillation ovens where all the by-products—tar, gas, ammonia, etc.—are saved. The increase in production of by-product coke was over twice as large as the increase in beehive coke.

The principal increase in by-product coke production in 1913 was in Alabama, where the gain was nearly 50 per cent, from 1,349,797 tons in 1912 to 2,022,959 in 1913. The increase in Pennsylvania was nearly one-third, from 1,974,619 tons in 1912 to 2,628,680 tons in 1913. Indiana showed an increase of 110,686 tons, and Illinois of 94,609 tons.

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Minimum, 25 words, 50c. Each additional word, 2c. All capitals, 25 words, 75c. Each additional word, 3c.

Miscellaneous Classified
Minimum, 25 words, $1.00. Each additional word, 4c. All capitals, 25 words, $2.00. Each additional word, 8c.

Men Wanted

IF ACTUALLY QUALIFIED FOR EXecutive, technical, professional, or administrative position between $2,500 and $12,000; communicate confidentially with undersigned counsel. Give name and address only for preliminary details; strictest privacy and safety assured. R. W. Bixby, Lock Box 134-C5, Buffalo, N. Y.

FOREMAN MACHINIST—TWO (2) GOOD experienced foremen wanted by large manufacturing concern, to work under head foreman; expected to alternate each week day and night turn; ability to handle men and turn out work economically and accurately the requirements; steady work at all times. Address Box 188, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — A-NO. 1 FOREMAN FOR gray iron foundry in middle west doing railroad work; open shop; must be a hustler; state age, experience and references, also salary wanted. Address Box 189, THE IRON TRADE REVIEW, Cleveland, O.

THE BEST WAY TO GET A GOOD POsition in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

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STEEL FOUNDRY SUPERINTENDENT of wide experience looking for position; used to all classes of steel casting work; can get results; good references. Address Box 192, THE IRON TRADE REVIEW, Cleveland.

AS FOREMAN OF PATTERN SHOP. Over 12 years as foreman employing from 20 to 100 men. Broad experience with molding machines, gas and oil engines, electrical machinery and dies. Address Box 987, THE IRON TRADE REVIEW, Cleveland, O.

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MECHANICAL ENGINEER, TECHNICAL graduate, 29 years of age, married; experienced as master mechanic of rolling mills, power plants and cement plants, or capable of taking charge of pattern shop, brass or iron foundry, machine shop or smith shop. Address Box 101, THE IRON TRADE REVIEW, Cleveland, O.

WANTED POSITION:—BY A GAS AND oil engine salesman, first class; 38 years of age; 14 years' experience in the engine business; do not care to handle engines under 20 horsepower. Address Box 190, THE IRON TRADE REVIEW, Cleveland, O.

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YOUNG, TIRELESS, COMPETENT man, fully qualified by widely successful statistical, economic, production and financial experience as OPERATING MANAGER OF STEEL PLANTS, desires operating metallurgical or executive position with rolling mill or foundry doing steady business, wherein his efforts will not be lost. Address Box 143, THE IRON TRADE REVIEW, Cleveland.

A TRAINED BUSINESS MAN OF 35 with ability to analyze, decide, plan, delegate and act; experienced in finance, costs, credits, accounts, sales purchases, in fact all branches of manufacturing business, wishes, for excellent reasons, to make a change. At present general manager of a corporation, before that secretary and treasurer. Good record, gilt edged references. Address Box 147, THE IRON TRADE REVIEW, Cleveland.

OPEN HEARTH STEEL MELTER wants position with live concern; 20 years' experience specializing in steel castings and all kinds of wire goods; a hustler and producer; now employed, good reason for desiring a change; best of references. Address Box 183, THE IRON TRADE REVIEW, Cleveland, O.

PRACTICAL SUPERINTENDENT DEsires change from present position; experienced miner, mill designer, ore concentrator, technical chemist, surveyor, graduate mining metallurgist; iron, manganese, coal, limestone; 27; references. Address Box 110 THE IRON TRADE REVIEW, Cleveland.

POSITION WANTED: — BLAST FURnace and steel mill master mechanic of long experience in construction and operation is open for engagement; steam and electric power equipments given special attention. Address Box 132, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY SUPERINTENDENT OR general foreman; up-to-the-minute in modern practice; 20 years' executive experience in largest iron, steel and malleable foundries; can lower manufacturing cost and solve most difficult shop problems; seeks change where results and close attention to business would be appreciated. References. Address Box 186, THE IRON TRADE REVIEW, Cleveland, O.

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A PRACTICAL FOUNDRY FOREMAN would like to correspond with parties desiring a good reliable man. Address Box 187, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED:—ERECTING ENgineer; 38 years of age; 14 years' experience, 6 years superintendent of department; has experience in selling, effecting settlements and final payments; can furnish best of references, 9 years in last position. Address Box 191, THE IRON TRADE REVIEW, Cleveland.

POSITION WANTED—AS ASSISTANT engineer or will fire, wipe or oil; experienced; I. C. S. student; best references; strictly sober; hold first-class license; will consider small salary if advanced as merited. Address Robert Pieper, 127 W. Rose St., Owatonna, Minn.

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Chrome-Nickel Chrome-Vanadium

Chrome Nickel Carbon

Leading Manufacturers of

5-Ply Safe and Burglar-Proof Vault Steel

We manufacture all our own steel, using only the purest base metals and alloys.

Our bars are rolled exclusively from our own *universal or forged* billets.

We solicit inquiries for steel made to your specifications and subject to your own inspection.

Our Metallurgical and Research Departments are at the service of our customers.

Send for new catalogue.

Carbon Steel Company

PITTSBURGH

Chicago Cleveland Detroit New York

Alphabetical list of Advertisers, page 105. | Table of Contents, page 39. | "Where to Buy," page 108.

Opportunities, page 102. | Second-Hand Machinery, page 103. | Engineering Directory, page 130.

Boiler, Ship and Structural Rivets

ON EVERY HEAD

Unbroken After 15 Years' Test.

Hold some Reliable Maker Responsible for the Quality of Rivets You Drive

Coupler and Air Brake Pins
STANDARD SPECIFICATIONS

Booklet "Scientific Facts" Free Upon Application.

Largest Rivet Manufacturers in the world—40,000 kegs in stock.

The Champion Rivet Co., CLEVELAND, OHIO, U. S. A.

Wagon Hardware,
Nuts, Washers,
Rivets,
Forgings,
Pole Line
Hardware

1863

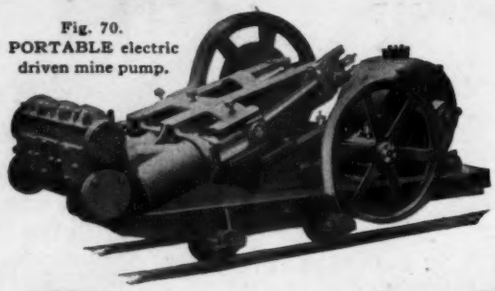
MACHINE CARRIAGE **BOLTS** TRACK BRIDGE

1914

Picks,
Mattocks
and
Grub Hoes,
Crow Bars,
Wedges, Etc.

Oliver Iron & Steel Co.
Established 1863
PITTSBURGH, PA.

Fig. 70.
PORTABLE electric driven mine pump.



DEMING MINE PUMPS

Low cost of repairs, even when the mine is making a great deal of sulphur water; starting and stopping by electric switch; no clouds of steam to blind and choke the miners; no need for a pump man; these are features of Deming Mine Pumps. Hundreds of mines now use them.

Complete catalogue on request.

The Deming Company, Salem, Ohio
Hand and Power Pumps for All Uses

General Distributing Houses:
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Ralph B. Carter Co., 152 Chambers St., New York City
Root, Neal & Co., 178-180 Main St., Buffalo, N. Y.

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CHICAGO RAWHIDE PINIONS

THE CHICAGO RAWHIDE CO.
1301 ELSTON AVE CHICAGO ILL

RITER-CONLEY MANUFACTURING CO.

Designers, Fabricators and Erectors of Structural and Plate Work of Every Description

Blast Furnaces	Gas Works Construction	Penstocks
Bridges and Girders	Grain Elevators	Pipes (Riveted Steel)
Mill and Office Buildings	Viaducts	Stand Pipes, Tanks, Towers
Coal Tipples	Heads (Flanged and Dished Boiler)	Stills
Digesters	Kilns (Cement)	Steel Barges
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PITTSBURGH, PA.

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STEEL PLATES AND SHEETS,
FLANGED AND DISHED HEADS, LAP WELDED
CHARCOAL IRON BOILER TUBES

COATESVILLE, PA.

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MASON EVANS, Treas. CHARLES B. CUSHWA, Gen. Supt. G. F. DANIELSON, Mgr. Pressed Steel Dept.

The Youngstown Iron & Steel Company

YOUNGSTOWN, OHIO

Manufacturers of

Red Steel Plates
Box Annealed Sheets
Blue Annealed Steel
Galvanized Steel Sheets

Bessemer and Open Hearth

Corrugated Steel Sheets---Expanded Metal and Metal Lath

Special Sheets for Deep Drawing

ALL INQUIRIES GIVEN PROMPT ATTENTION

PIG IRON

Northern Foundry — Malleable Bessemer

"BAY VIEW"

Acid and Basic Open Hearth, Bessemer, Electric and Alloy Steels

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UNFINISHED MATERIALS—Forging Ingots, acid or basic steel, up to 100,000 lbs. each. Billets and Blooms, all sizes. Sheet Bars. Foundry and Malleable Bessemer Pig Iron. STRUCTURAL SHAPES—Angles. I Beams. Brake Beams. Plates, Sheared and Universal Mill. Channels. Tees. Zees. BAR MILL PRODUCTS—Bands. Half Rounds. Reinforcing Bars. Steel Tires. Cultivator Beams. Ovals. Rounds. Toe Calk. Flats. Pipe Bands. Saw Mill Track. U Bars. Half Ovals. Plow Beams. Squares. RAILROAD MATERIALS—Axles. Angle Bars. Track Bolts. Base Plates. Rails, heavy and light. Track Spikes. Frog Fillers. Tie Plates. Screw Spikes.

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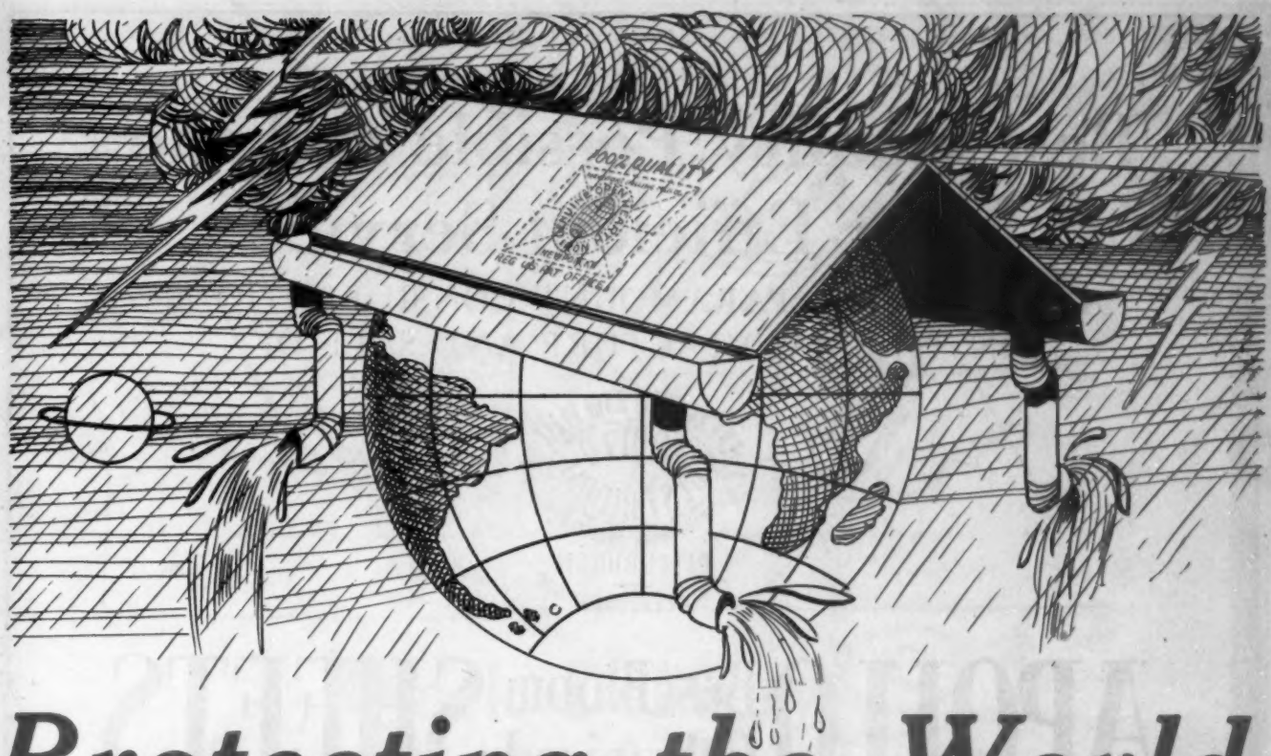

Protecting the World

from

the destructiveness of the Elements

Genuine Open Hearth Iron is unaffected under all conditions. Neither the roughest treatments of the cold, cruel Winters nor the most severe attacks of the deadly hot suns of Summer have any effect upon it.

North, East, West and South,

Genuine Open Hearth Iron

The Serviceable Sheet Metal

can always be used for any out-of-door or exposed purpose, with a feeling of **perfect security.**

From the raw material, which is the best that the market affords, to the finishing of the product, the entire process is in the hands of specially trained men whose **scientific knowledge** and **actual experience** enable us to produce **100% Quality.**

Genuine Open Hearth Iron is being specified by the United States Government and by leading engineers.

Be sure YOU specify it!

Newport Rolling Mill Co.

NEWPORT, KENTUCKY

Best Quality Possible and the Most Efficient Service

ARE THE TWO PARAMOUNT CONSIDERATIONS
IN THE MANUFACTURE AND SALE OF

APOLLO Best Bloom Galvanized SHEETS

"A product without a peer"

These sheets are uniform in quality, even in gauge, pliable and easily worked. Merit alone has made APOLLO BEST BLOOM the standard of all galvanized sheets. Unexcelled for Culverts, Cisterns and all underground uses where the metal comes in contact with the moist earth. Sold by leading jobbers everywhere.

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Manufacturers of **SHEET AND TIN MILL PRODUCTS** of Every Description

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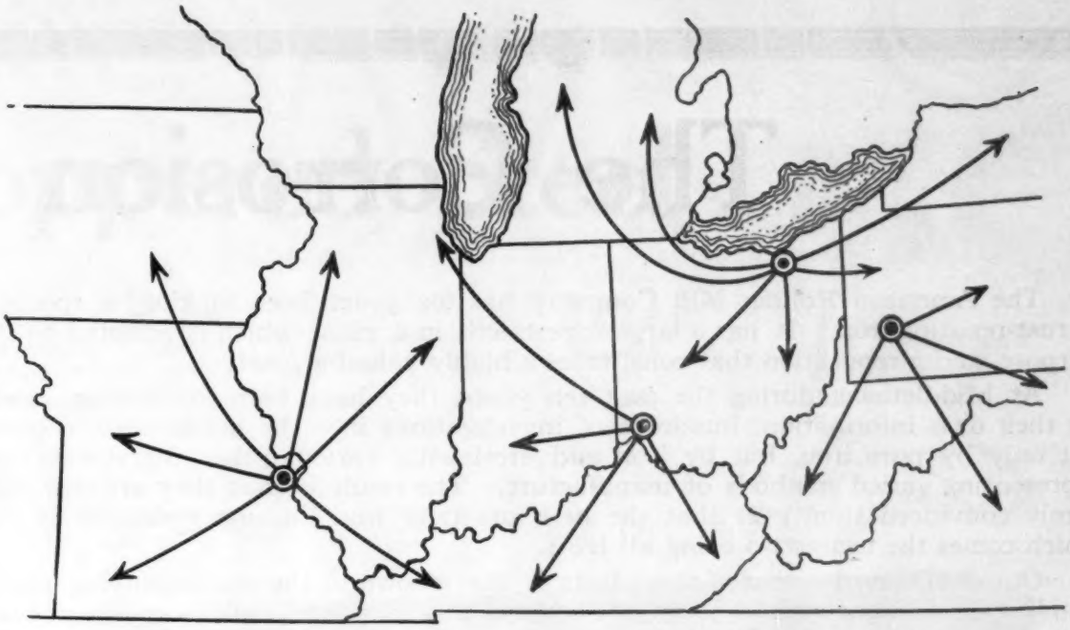


Quick Delivery to Every Part of the Country

Right in the heart of the great manufacturing and distributing region of the Great Lakes and Middle West, and at the strategic points of rail and water connection, you find Bourne-Fuller warehouses.

They are ready to send your order forward the very day it is received.

An expert Traffic Manager decides upon the proper routing, telephones the billing to the initial railroad as soon as the material is ready and follows the progress of every car to destination.

Bourne-Fuller service is "all-the-way" service, from mill or warehouse to user.

Structural shapes, plates, sheets, bar-iron, bar-steel, twisted bars for reinforcing concrete, rivets, Byers Wrought-Iron Pipe, Scott's All Crucible Tool Steels, etc.

Write for Monthly Stock List. It shows complete stock ready for immediate shipment at the time of issue each month.

THE
BOURNE-FULLER CO

Iron, Steel
Pig Iron
Coke

CLEVELAND

Pittsburgh **Cincinnati**

BOURNE-FULLER STEEL CO
St. Louis

The Corrosion of C

The American Rolling Mill Company has for years been making a specialty of rust-resisting iron. It has a large investment in a plant which is adapted to this purpose, and a reputation that constitutes a highly valuable asset.

At Middletown, during the past ten years, they have been conducting, chiefly for their own information, hundreds of investigations into the actual service given, not only by pure iron, but by iron and steel with various other ingredients and representing varied methods of manufacture. The result is that they are now more firmly convinced than ever that the best practical iron for rust resistance is that which comes the nearest to being **all iron.**

One of the most recent of these tests is that shown in the accompanying photograph. On a framework of joists, in the form of a box, were nailed samples of black and galvanized iron of uniform gauge, and on March 17th, 1913, this box was filled with stable manure. The samples were thus exposed to the manure on one side and to the atmosphere on the other, the box being located in that portion of the mill yard which is devoted to exposure tests.

The photograph shows the condition of the samples on the west side in December, 1913. The analyses are printed over each sheet. All of these were black, twenty-six gauge, corrugated sheets, and all had exactly the same treatment in the test.

The first, third and fifth from the left are

Armco---American Ingot Iron

The second and fourth are samples purchased in the open market of a metal which has been widely advertised as rust and corrosion resistant **because of a high content of copper.**

The test at the present time is progressing along the same lines as are here indicated. The American Ingot Iron has a thin film of very closely adherent rust, of a dark brown color, but the body of the metal is but very little affected. **Of the three high purity samples the one with the least copper shows the least rusting.**

The coppered material shows numerous holes, and is in a condition of practical failure.

The importance of this form of test is shown by the following facts: There are approximately six million farms in the United States, upon nearly all of which there is occasion to use sheet metal products and very often in locations exposed either to direct contact with or to fumes from stable debris. If each of these farms purchase but one square annually, the resulting yearly use is three hundred thousand tons.

THE AMERICAN ROLL ING

MIDDLETOWN OHI

Licensed Manufacturers under patents granted the International Metal Products Company

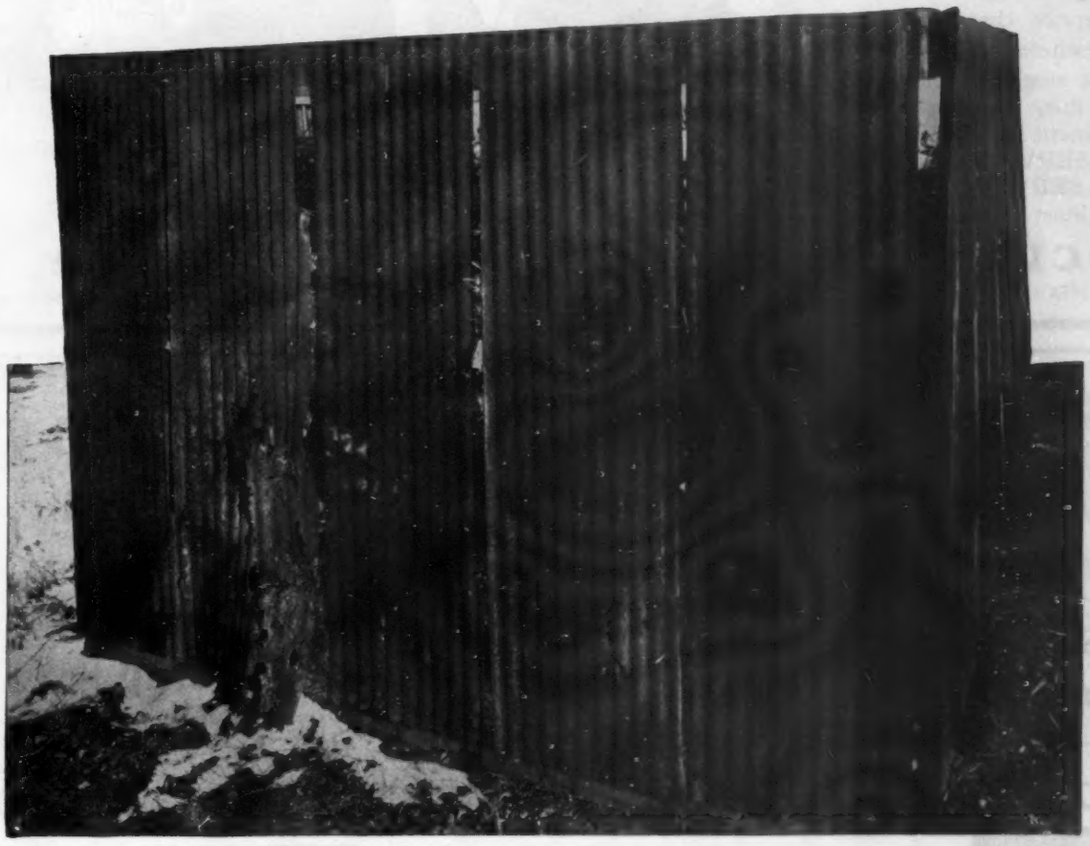
Armco Iron Roofing, Siding, Sheets, Plates, Pipe, Gutter and Terne Plate

CHICA
CLEVE
DETRO
NEW Y

f Coppered Steel

Sulphur	.027%	.027%	.021%	.030%	.038%
Phosphorus	.006	.008	.004	.006	.013
Carbon	.012	.060	.010	.11	.010
Manganese	.032	.197	.040	.189	.023
Copper	.068	.223	.020	.312	.032

American Ingot Iron | Copper Steel | American Ingot Iron | Copper Steel | American Ingot Iron



ING MILL COMPANY

OHIO

DISTRICT SALES OFFICES:

CHICAGO, 1266 Peoples Gas Bldg.
CLEVELAND, 952 Rockefeller Bldg.
DETROIT, 902-903 Ford Bldg.
NEW YORK, 551 Hudson Terminal Bldg.
MILWAUKEE, Majestic Bldg.
PITTSBURGH, 1832 Oliver Bldg.
ST. LOUIS, 814 New Bank of Commerce Bldg.

Another Feature of

"SCULLY SERVICE"

We have installed in our Warehouse the largest set of Corrugating Rolls in Chicago and we are prepared to furnish immediately from stock corrugated sheets, black, painted or galvanized, in gauges No. 10 to No. 30 inclusive, with 1¼", 1½" or 2½" corrugations. Our complete stock of sheet steel makes it possible for us to give SCULLY SERVICE on every order received for corrugated material and SCULLY SERVICE means IMMEDIATELY—it eliminates delay. This added equipment is just another proof of our desire to give bigger, better and quicker service than can be obtained elsewhere. REMEMBER, a complete stock of everything in the steel line, together with the best equipment for handling makes SCULLY SERVICE possible, and SCULLY SERVICE is your insurance against delay.

SCULLY STEEL AND IRON COMPANY

CHARLES HEGGIE, President GEORGE MASON, JR., Vice President

Seneca Iron and Steel Company

STEEL SHEETS

Seneca Brand Stands for Quality

Black, Galvanized, Corrugated and Formed Roofing

Buffalo, N. Y.

TRADE MARK. LION BRAND ALLOYS & METALS

FERROALLOYS METALS AND ORES

GEO. G. BLACKWELL, SONS & CO., LIMITED

THE ALBANY, LIVERPOOL, ENG.

Manufacturers, Metallurgists, Mine Owners, Merchants

WORKS: Garston Docks. CODES: A. B. C., Moreing and Neal, Lieber's and Western Union.

FOUNDED 1869 BY GEO. G. BLACKWELL

CHROME ORE. Blackwell's special Refractory quality for Furnace Linings.
MANGANESE ORE of every grade. FERRO URANIUM.
FLUOR SPAR. We are the largest mine owners in the world.
S. A. M. ALLOY. Produces sound ingots and blowhole-free castings.
FERRO-PHOSPHORUS. CARBONLESS CHROMIUM METAL.
FERRO-MOLYBDENUM. Pure Molybdenum. MOLYBDENITE.
FERRO-CHROME. 60-72% Cr., 1-2% to 1% Carbon and any % up to 10%.
FERRO TUNGSTEN. 50-90%. TUNGSTEN METAL, 96-99%.
FERRO-TANTALUM.
FERRO-TITANIUM, FERRO BORON, FERRO VANADIUM, 25 and 50%.
FERRO-SILICON, 25%, 50%, 75%. COPPER SILICON.
PLUMBAGO, BLACKLEAD, METAL WORKERS' CRAYONS.

We make any and EVERY ALLOY AND METAL REQUIRED
We make a SPECIAL HIGH SPEED ALLOY FOR TOOL STEEL

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Y STEEL BRAND PIPE STAR IRON BRAND

YOUNGSTOWN, OHIO.

THE YOUNGSTOWN SHEET AND TUBE COMPANY NEW PROCESS PATENTED YOUNGSTOWN, OHIO. GALVANIZED SHEETS

THE YOUNGSTOWN SHEET AND TUBE COMPANY NEW PROCESS PATENTED YOUNGSTOWN, OHIO.

"NEW PROCESS" GALVANIZED SHEETS

With our organization and complete control of manufacture, from ore to bundling table, we can make just as good sheets as anybody by any process.

We are not satisfied with this, hence the "NEW PROCESS."

The "NEW PROCESS" is our own expensive and patented method of galvanizing, which insures the toughest possible galvanized coating.

In fact, users have called "NEW PROCESS" Sheets "The Toughly Coated Kind."

It will be to your advantage to specify "NEW PROCESS" Sheets.

DOUBLE REFINED PUDDLED IRON ROOFING

DISTRICT SALES OFFICES

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PITTSBURG, PA. — DENVER, COLO.
DALLAS, TEX. — SAN FRANCISCO, CAL.
ST. LOUIS, MO. — SEATTLE, WASH.
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BUCKEYE FENCE

LA BELLE

La Belle Sheets are quality sheets.

They are so recognized by the workman who uses them, because they are soft, pliable, workable. They are uniform of texture so that there is minimum waste in cutting.

This means more sheet value for your money, which is equivalent to paying less for your sheets than the fellow who gets inferior goods.

There's a reason for their uniform quality.

It is our ownership of all the sources of the raw materials from which they are made and the fact that they are all made in one modern plant under one management.

"From mine to market".

La Belle Iron Works

General Offices: Steubenville, O.

Works; Wheeling, W. Va. **Works: Steubenville, O.**

PORTSMOUTH IRON

"Like a Stone Wall to Rust and Corrosion."

Is the leading rust resistant iron in the present day market. Its leadership has been earned by accepted merit—by quality that is of the same high standard in every pound—quality that should hold considerable interest for you.

OHIO METAL

"Copper Bearing Steel"

is pure iron's nearest rival in rust resisting and workable qualities—cheaper in price, but most exceptional value for an infinite number of uses.

Either or both of two books describing Portsmouth Iron and Ohio Metal are awaiting your inquiry.

Portsmouth Steel Co.

General Offices & Works, Portsmouth, O. Executive Offices, Wheeling, W. Va.

THE UNITED STEEL CO

When You Think

of

VANADIUM

Think of

UNITED

Cross Rolled

Chrome Vanadium Bars

The Non-Fatigue Steel

THE UNITED STEEL CO

Canton Ohio

New York Chicago Detroit

VISMERA IRON

99.86 % PURE IRON

GUARANTEED IN CONTRACT

This is the first time in the history of the manufacture of

Plates and Sheets

that any maker has dared to *guarantee* so high a degree of iron purity.

This Purity Means Maximum Resistance to Rust and Corrosion

Note especially our triumph over the oxides — most troublesome of all impurities and probably the most destructive.

We have mastered the art of using manganese as a purge, in such a way that the manganese disappears with the impurities it carries off.

Sample Analysis of Vismera Iron

(Two points better than our guarantee)

The following is an analysis of Vismera Iron which is usually produced in our regular practice and it can be assumed we shall not vary much from this analysis:

Silicon	None
Copper	None
Aluminum Oxide	None
Carbon	.040
Phosphorus	.004
Sulphur	.020
Manganese	.040
Hydrogen	.001
Oxygen	.009
Nitrogen	.004
Total Impurities	.118
Total Content	100.000
Total Impurities	.118
Total Purity	99.882

Our Capacity for Producing Vismera Iron Plates and Sheets Has Been Greatly Enlarged

And we are now prepared to execute orders of any magnitude, with dispatch.

We can take care of l. c. l. orders when not too badly mixed, as we wish the largest possible number of manufacturers and engineers to know Vismera, "first hand," by actual use.

We will ship Vismera to any part of the world in competition with any other rust-resisting sheets or plates offered by whomsoever.

GET OUR LISTS AND PRICES

INLAND STEEL COMPANY

First National Bank Building, Chicago

Works, Indiana Harbor, Indiana

Branch Offices:

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TRUMBULL STEEL CO.

DIVERSIFIED
SHEET AND TIN MILL PRODUCTS

TRUMBULL ROOFING AND SIDING

All styles manufactured from our own Sheet and Tin Mill Products.

Corrugated	Open Hearth Ternes
V Crimped	Roofing Tin in Rolls
Pressed Standing Seam	Metal Shingles
Roll Roofing	Metal Tile
Ridge Roll, all styles	Steel Siding

Other extensively manufactured products include Black and Galvanized Flat Sheets—Bright Coke and Charcoal Tin Plate.

THIS BRAND SIGNIFIES QUALITY

WARREN, OHIO.

Richard G. Wood, President
J. R. Jones, Vice-Pres. and Treas.

Established 1826

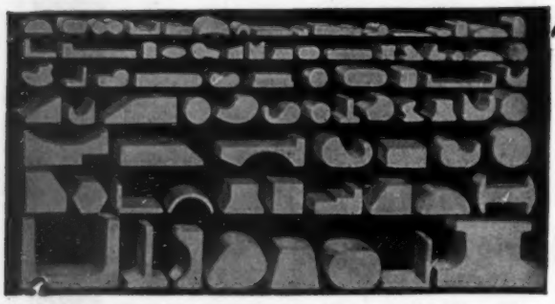
W. W. Lukens, Sec. and Asst. Treas.
Howard Wood, Jr., Asst. Sec.

Alan Wood Iron & Steel Co.

PIG IRON BILLETS BLOOMS SLABS
IRON AND STEEL SHEETS AND PLATES
FORGING BILLETS

"A. W. Diamond" and "A. W. Ribbed" Pattern Rolled Steel Floor Plates.

Morris Building, PHILADELPHIA, PA.



Offices and Warehouses: New York: 460-466 Washington St. Philadelphia: Ninth and Willow Sts. Cincinnati: Spring Grove Avenue. Chicago: Jefferson and Monroe Sts. Boston: 95 Milk Street.

THE WORLD'S LARGEST
Bright Finished Steel Plant
OFFERS YOU
Quality AND Service

Bessemer, Open Hearth, Nickel, Chrome and Vanadium Steel
Service That Is Unequaled
Besides a very large stock carried at the mill,
These Warehouses carry a large and complete stock in all sizes, of
COLD DRAWN SHAFTING and SCREW STOCK
In all sizes of Rounds, Flats, Squares and Hexagons

UNION DRAWN STEEL CO., MAIN OFFICE AND WORKS Beaver Falls, Pa.

CARNEGIE STEEL COMPANY

General Offices --- Pittsburgh, Pa.

STEEL CROSS TIES

Reflect on what it costs to dispose of discarded wood ties; then consider that a discarded steel tie is good melting scrap, and is worth approximately one-third its original cost.

It will pay you to investigate the advantages of steel ties.

DISTRICT SALES OFFICES:

Birmingham	Chicago	Denver	New York
Boston	Cincinnati	Detroit	Philadelphia
Buffalo	Cleveland	New Orleans	Pittsburgh
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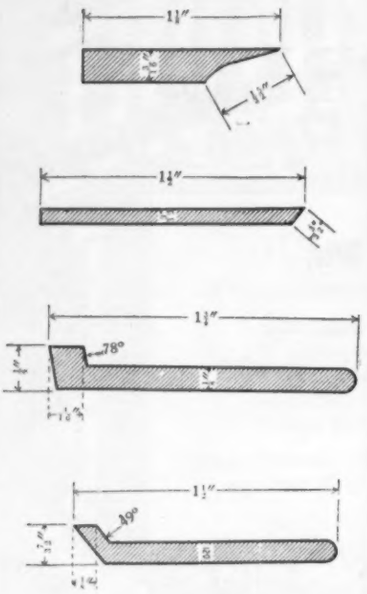
UNITED STATES STEEL PRODUCTS COMPANY, PACIFIC COAST DEPARTMENTS:

Los Angeles	San Francisco	Portland	Seattle

EXPORT REPRESENTATIVES:
UNITED STATES STEEL PRODUCTS COMPANY, New York, N. Y.

10-T.

"THE TOOL STEEL MILL"



BRAEBURN
Lawn Mower Shapes

If you wish *excellency* and *service* in Lawn Mower Shapes, specify *"Braeburn"*.

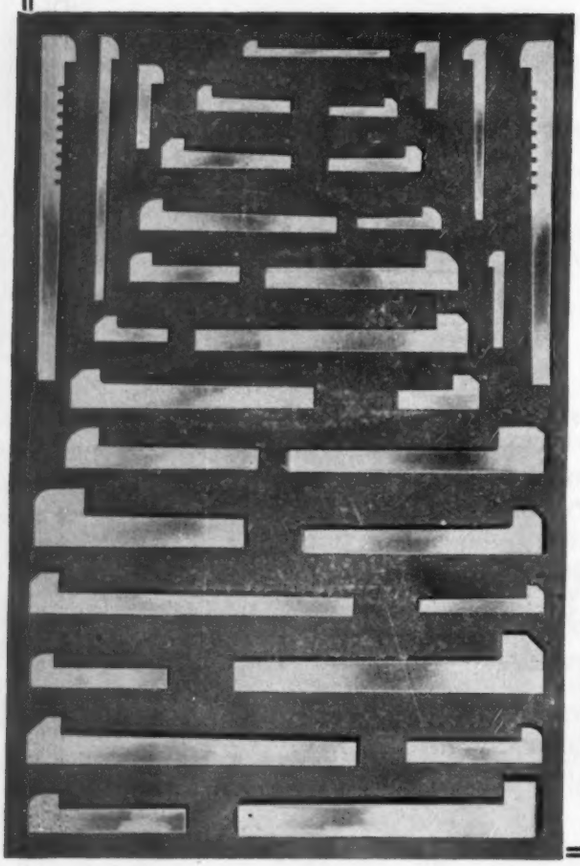
"Braeburn" will safeguard you from all steel troubles.

We specialize *tool steels* of all kinds and for all purposes.

What are your requirements in *Tool Steel, Pressed Die Blocks, Hammered or Pressed Discs, Rolled or Hammered Bars,* etc.?

Write us at once.

BRAEBURN STEEL COMPANY
BRAEBURN, PA.



Finished Machine Keys

QUALITY SERVICE

INCREASED facilities and improved equipment enable us to offer even a better product than we have formerly produced and, incidentally, our manufacturing cost has been reduced and this advantage is passed on to our customers in the form of larger discounts.

We are thoroughly equipped to manufacture keys of special shape and can meet the most exacting demands for accuracy, quality and finish.

Sending your order to us insures satisfaction.

Illustrated catalog and price list on request

Standard Gauge Steel Co.
BEAVER FALLS, PA.

TURNED AND COLD-DRAWN STEEL SHAFTING

FINISHED ROUNDS, FLATS, SQUARES, HEXAGONS, ANGLES, CHANNELS AND SPECIAL SHAPES

COMPRESSED STEEL ELEVATOR GUIDES

MACHINE RACK

BESSEMER **STEEL** *OPEN HEARTH*

MERCHANT BARS

SHEET BARS

BLOOMS SLABS
SKELP SHAPES
ROUND POLISHED STEEL SHAFTING
BAR IRON OLD RAIL BARS

SHEARED PLATES

BOILER FLANGE TANK

"REPUBLIC" PIPE

Standard. Black and Galvanized
Line Pipe, Drive Pipe, Tubing and Casing

PIG IRON

RAILROAD SPIKES, BOAT SPIKES,
TURNBUCKLES, NUTS,
WASHERS, BOLTS

BILLETS

Republic Iron & Steel Co.

General Offices, Republic Bldg., Youngstown, Ohio

SALES OFFICES:

BIRMINGHAM	NEW YORK	CLEVELAND	CINCINNATI	DETROIT	DALLAS
CHICAGO	BUFFALO	ST. LOUIS	PITTSBURG	SAN FRANCISCO	PHILADELPHIA

The Manufacture of "NATIONAL"

NATIONAL

Chapter 43*

Relative Durability of Iron and Steel Boiler Tubes for Locomotive Service

¶ The subject of the last Chapter (42) on the **Relative Durability of Iron and Steel Boiler Tubes for Locomotive Service** is of so great importance that it can well occupy this and, it may be, subsequent chapters. Included was a comparative report on five passenger and five freight locomotives, showing an increase of 24 per cent in durability in favor of steel tubes.

¶ Before National Tube Company finally decided to abandon entirely the manufacture of charcoal iron tubes, the question of relative corrosion was practically disposed of, it being determined by a series of the most thorough practical tests in actual service and after thorough service investigations that steel (as made by "NATIONAL" methods and materials) was the most durable and reliable tube, particularly for locomotive service.

¶ It was found by carefully established comparisons of engines operating with steel and those operating with charcoal iron under the same conditions, that a decidedly better mileage was obtained with steel.

¶ As an evidence, the foreman boiler maker of one of the leading Eastern railroads reports they have used steel flues for 17 years, and continues, "I think we are pioneers in the business. About six years ago we tried a couple of sets of iron tubes; they lasted *ninety days*. We are getting about *eight months* out of the others." (The Boiler Maker, June, 1911, page 167.)

¶ A supplementary report was made by the official quoted in Chapter 42 (see issue June 11, pages 16 and 17) at the Fourth Annual Convention of International Master Boiler Makers' Association, Niagara Falls, May 24-27, 1910, and we quote from this report as follows:

> "You will remember that I submitted quite a lengthy report on this subject last year and I am pretty well exhausted with the exception of a few figures which I would like to submit to substantiate the argument I made last year in my report in favor of steel flues and safe ends.
>
> "Since I made my last report to you before the Master Boiler Makers' Association I have gathered some data. I have one engine that has 2¼-inch by 21-foot tubes to submit to you as evidence at this time. This engine when first turned out of shop was equipped with iron tubes and safe ends making a flue mileage of 47,230 miles. These flues were then removed and the same flues were safe ended with steel safe end material. After these flues had been applied this engine made a flue mileage of 68,361 miles, this making a gain of 21,131 miles in favor of the steel safe ending.
>
> "We have experienced no trouble to speak of on account of flues leaking since this engine was equipped with steel safe ends. We have also had a test made of 28 freight locomotives which were equipped with steel tubing and these engines made an average of 75,000 miles per engine.
>
> "Our previous flue mileage in this particular location equipped with iron flues would not average over 50,000 miles per engine, this would make a gain of 25,000 miles in favor of the steel flues. We do not experience any trouble in welding the steel safe ending in the iron flue. We have also had a great deal less of flue leakage with steel than we do with iron."

¶ Efficiency in all departments of railroad service is a fundamental requirement. Durability of material is one of the large factors composing departmental efficiency. "NATIONAL" Spellerized Boiler Tubes are no longer on trial—no longer a mere experiment, yet seventeen years ago, while still in the experimental stage to some extent, a large railroad discontinued the use of the old charcoal iron tube.

¶ We are always glad to receive correspondence regarding special difficulties encountered in service. Our experience is at your service.

¶ The illustrated booklet, THE MODERN BOILER TUBE, will be of interest in this connection.

National Tube Company

NATIONAL

and Characteristics Modern Welded Pipe

NATIONAL

¶ Many Railroad officials find reasons for preferring THE MODERN STEEL BOILER TUBE, i.e. "NATIONAL" Boiler Tubes.

From here and there throughout the report from which we quote on opposite page, the following is also taken:

"The steel is always uniform in quality."

"So densified it is not so liable to pitting and corrosion."

"Can be installed at a less expense."

"Under test shows .03% sulphur, .017% phosphorus."

"The most economical body tube for locomotives."

"Increased flue mileage 25%."

"We are coming to the use of steel flues very rapidly."

"It would be impossible for me to come here and advocate iron."

"Steel hav run from 25 to 35% more than iron in actual service."

"I cannot say iron flues are as good as steel."

"We are getting better results from steel tubes."

"According to the report the steel flue has a little the best of the iron flue."

"I am of the opinion that steel flues are the coming thing."

Next week's issue (July 2) will contain Experience No. 7 of the series, Interesting Experiences with "KEWANEE" Unions, entitled, "Rip 'er Out! Put in 'KEWANEE'"; the following issue (July 9) will contain Chapter 44 of this series, and will continue the present subject.

SPECIAL TEST APPLIED TO "NATIONAL" SPELLERIZED STEEL LOCOMOTIVE BOILER TUBES

¶ This Test combines the vertical crushing, horizontal flattening and flange tests on one piece. A special machine has been designed, which enables the test to be made very quickly, and as crop ends are used, the cost is reduced to a minimum. If the test piece opens at the weld or elsewhere the tube from which it was cropped is rejected. If the tube stands the above test on the ends the regular hydraulic internal pressure test is then applied.

¶ First piece to the left shows a crop end of a Boiler tube (two crop ends are cut from every "NATIONAL" SPELLERIZED STEEL LOCOMOTIVE BOILER TUBE). The second piece shows the crop end laterally crushed; and the third piece shows the crop end crushed vertically with a flange turned on the top. It should be borne in mind that every single "NATIONAL" SPELLERIZED BOILER TUBE for locomotive service receives this test twice—once on each crop end—the combined test being made in one operation while the piece is held in the testing machine.

*This is the Forty-third of a series of announcements as follows:

Chap. I.—Early History—(First Iron Tubes.) (Published October 3, 1912.)
Chap. II.—Early History Continued—(Butt-Welding). (Published October 17.)
Chap. III.—Early History Continued—(Early Methods of Piping). (Published November 7.)
Chap. IV.—Early History Continued—(Early and Modern Oil Well Casing Contrasted.) (Published November 21.)
Chap. V.—The Ore and the Tube. (Published December 5.)
Chap. VI.—Need for Cheaper Steel. (Published December 19.)
Chap. VII.—The Bessemer Converter. (Published January 2, 1913.)
Chap. VIII.—Only Full Weight Pipe Made in Future. (Published January 16.)
Chap. IX.—Spellerizing and Marking. (Published February 6.)
Chap. X.—Welded Tubes and Pipes. (Published February 20.)
Chap. XI.—"NATIONAL" Bulletins about "NATIONAL" Pipe. (Published [March 6.)
Chap. XII.—Materials for Pipe. (Published March 20.)
Chap. XIII.—The First Steel Pipe. (Published April 3.)
Chap. XIV.—Changes in the Tubular Industry (Published April 17.)
Chap. XV.—The Continuous Uniformity of "NATIONAL" Pipe. (Published May 1.)
Chap. XVI.—Pipe Threading. (Published May 15.)
Chap. XVII.—Physical Properties. (Published June 5.)
Chap. XVIII.—Bursting Pressure. (Published June 19.)
Chap. XIX.—The Inspections and Tests of "NATIONAL" Pipe. (Published July 3.)
Chap. XX.—Spellerizing "NATIONAL" Pipe. (Published July 17.)
Chap. XXI.—"NATIONAL" Pipe for Refrigerating Systems. (Published August 7.)
Chap. XXII.—Corrosion of Pipe in Coal Mines. (Published August 21.)
Chap. XXIII.—Corrosion of Pipe in Coal Mines, Continued. (Published Sept. 4.)
Chap. XXIV.—Corrosion of Pipe in Coal Mines, Concluded. (Published Sept. 18.)
Chap. XXV.—Corrosion of Pipe in Hot Water Systems. (Published October 2.)
Chap. XXVI.—The Design of Hot Water Supply Systems to Minimize Corrosion. (Published October 16.)
Chap. XXVII.—Corrosion of Pipe—Part I. (Published Nov. 6.)
Chap XXVIII.—Corrosion of Pipe—Part II. (Published November 20.)
Chap. XXIX.—Corrosion of Pipe in Greenhouse Service. (Published Dec. 4.)
Chap. XXX.—"NATIONAL" Pipe for Gas Lines—Part I. (Published Dec. 18.)
Chap. XXXI.—"NATIONAL" Pipe for Gas Lines—Part II. (Published Jan. 1, 1914.)
Chap. XXXII.—170 Quarts of Nitroglycerine Did Not Crack "NATIONAL" Pipe. (Published January 15.)
Chap. XXXIII.—Corrosion of Pipe in General Service—Part I. (Published Feb. 5.)
Chap. XXXIV.—Corrosion of Pipe in General Service—Part II. (Published Feb. 19.)
Chap. XXXV.—Corrosion of Pipe in Boiler Feed Water Service—Part I. (Published Mar. 5.)
Chap. XXXVI.—Corrosion of Pipe in Boiler Feed Water Service—Part II. (Published March 19.)
Chap. XXXVII.—Relative Corrosion of Iron and Steel Pipe for Plumbing Purposes. (Published April 2.)
Chap. XXXVIII.—A Summary of Results of Investigations. (Published April 16.)
Chap. XXXIX.—Results of Investigations of Relative Corrosion of Iron and Steel. (Published April 30.)
Chap. XL.—Corrosion of Iron and Steel Pipe under Atmospheric Conditions. (Published May 14.)
Chap. XLI.—Corrosion of Boiler Tubes. (Published May 28.)
Chap. XLII.—Relative Durability of Iron and Steel Boiler Tubes for Locomotive Service. (Published June 11.)
Chap. XLIII.—Relative Durability of Iron and Steel Boiler Tubes for Locomotive Service. Continued. (Published June 25.)

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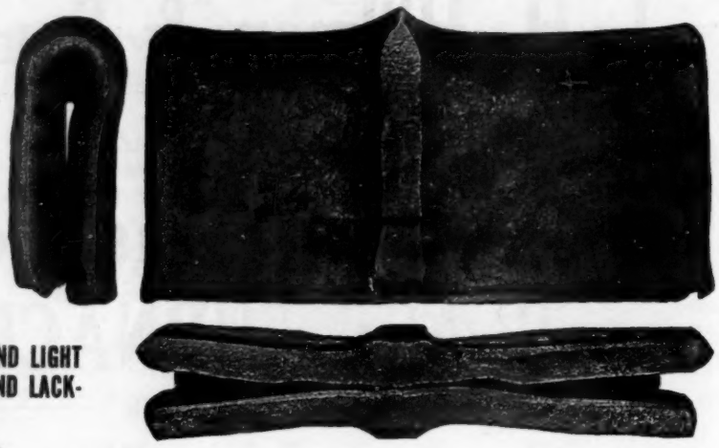

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Announcement!

The SECOND EDITION of

IRON ORES OF LAKE SUPERIOR

BY

CROWELL & MURRAY

is now on the press and will be ready for delivery July 1st.

¶ Completely revised and up-to-the-minute in every respect, this book will be welcomed by everyone interested in Iron Ores. *As a mailing list* it is invaluable as it gives the names of *managers*, *superintendents* and *sales agents* of all mines and their location.

The Contents in detail:

CHAPTER I
The Early History of the Region
A brief history of the Lake Superior Ore region.

CHAPTER II
Geology
A concise description of the general geology of the region—Detailed geology with ideal sections of the Vermilion Range, Mesabi Range, Cuyuna Range, Marquette Range, Menominee Range, Iron River, Crystal Falls and Florence districts, Baraboo District, Michipicoten Range and Moose Mountain District.

CHAPTER III
Mineralogy
Description and composition of the various iron ores found in the Lake Superior Region.

CHAPTER IV
Production of Ore
Methods used in exploring for ore—Mining methods used on the various ranges—Transportation of the ore from the mines to shipping docks, and from docks to the Lower Lakes—Tables showing freight rates from mines to docks, and from the docks to the Lower Lakes from the opening of the various ranges to date—Tables showing tonnage shipped from each range from the opening up of the same, to date.

CHAPTER V
Dock Equipment
Details of the various loading docks at the Upper Lake Ports—Description of the Lower Lake Port unloading docks, giving the various kinds of machines used, their size, capacity and other information.

CHAPTER VI
Classification of Ores
Showing the various changes and reasons for the same, in the classification of ores from the early days of mining to date. Describing the sampling of ore at the Mines, Lower Lakes and Furnaces.—Discussion on the value of ores with tables giving the prices of ore from the opening of the ranges to date—Showing how the value of ores are figured from their analyses.

CHAPTER VII
Beneficiation of Ores
Details of the various methods of concentration used in the Lake Superior region—A description of the Coleraine Washer—The Wisconsin Steel Co.'s plant at O'Brien Lake—The Wetherbee Concentrator at the Madrid Mine—The Concentrating Plant at the American Mine—Description of the Drying Plant at the Brunt Mine—Concentrating Plant at the Moose Mountain Mine—Description of the various processes for treating fine ore and flue dust.

CHAPTER VIII
Methods of Analyses
Description of the preparation of Standard Samples after receipt in the Laboratory—Moisture determination—Details for the determination of Iron, Phosphorus, Silica, Manganese, Alumina, Lime, Magnesia, Sulphur, and Loss on Ignition in iron ores.

CHAPTER IX
Fuel Engineering
Definition of Fuel Engineering—Various fields in which it is used—The economy gained by its intelligent use.

CHAPTER X
Location and Description of Mines
Data for each mine on the various ranges, showing the location, operating company, names of manager, superintendent and sales agent, methods of working the mine, greatest depth, route for shipping the ores, yearly shipments from the opening of the mine to date, and the 1913 cargo analyses of the ores shipped by each mine—Complete geological map of each Range showing the iron-bearing formations and the location of every mine.

INDEX
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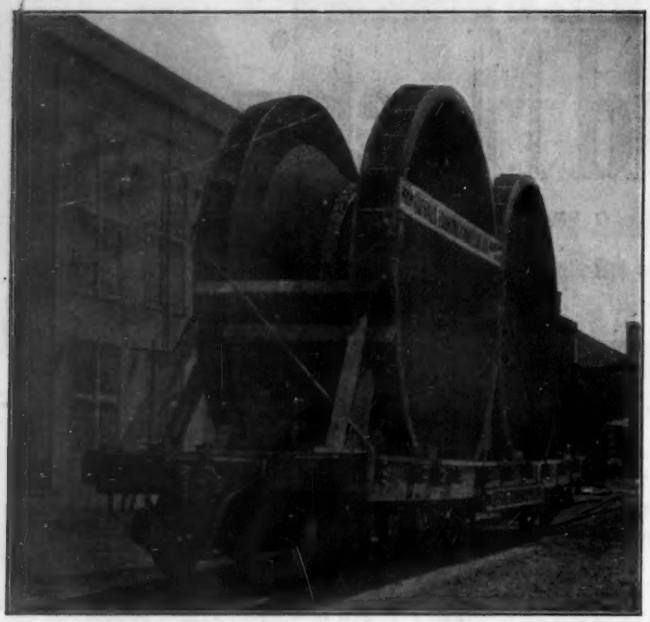

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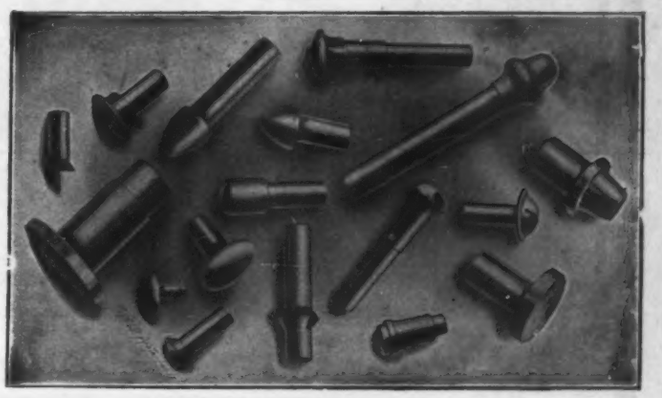

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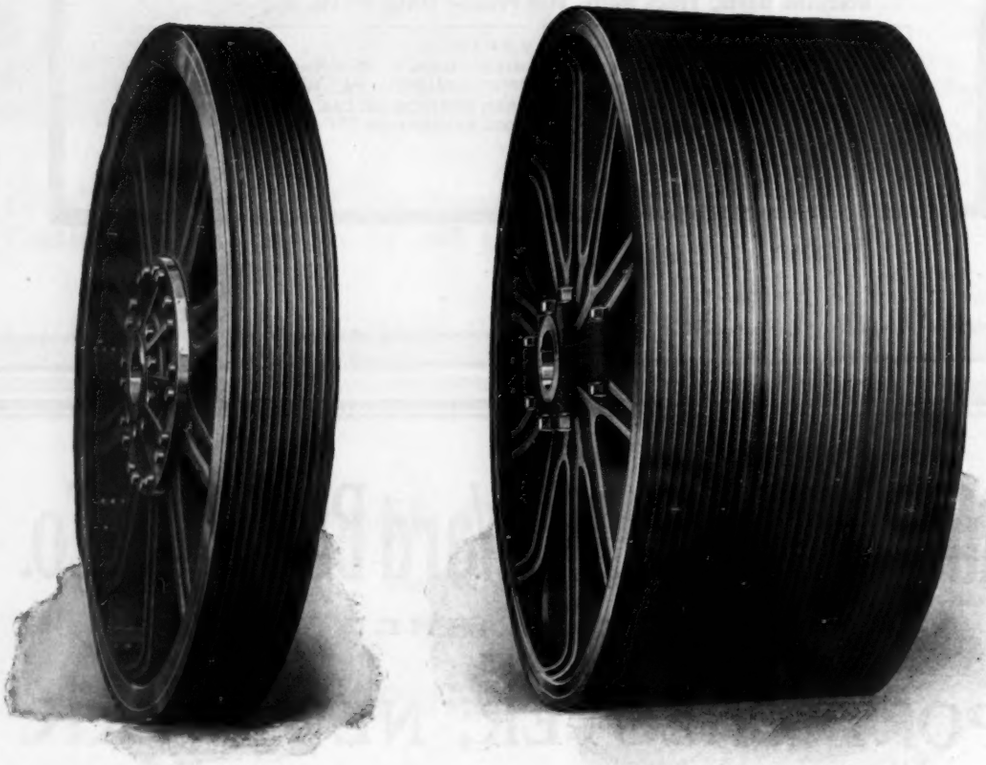

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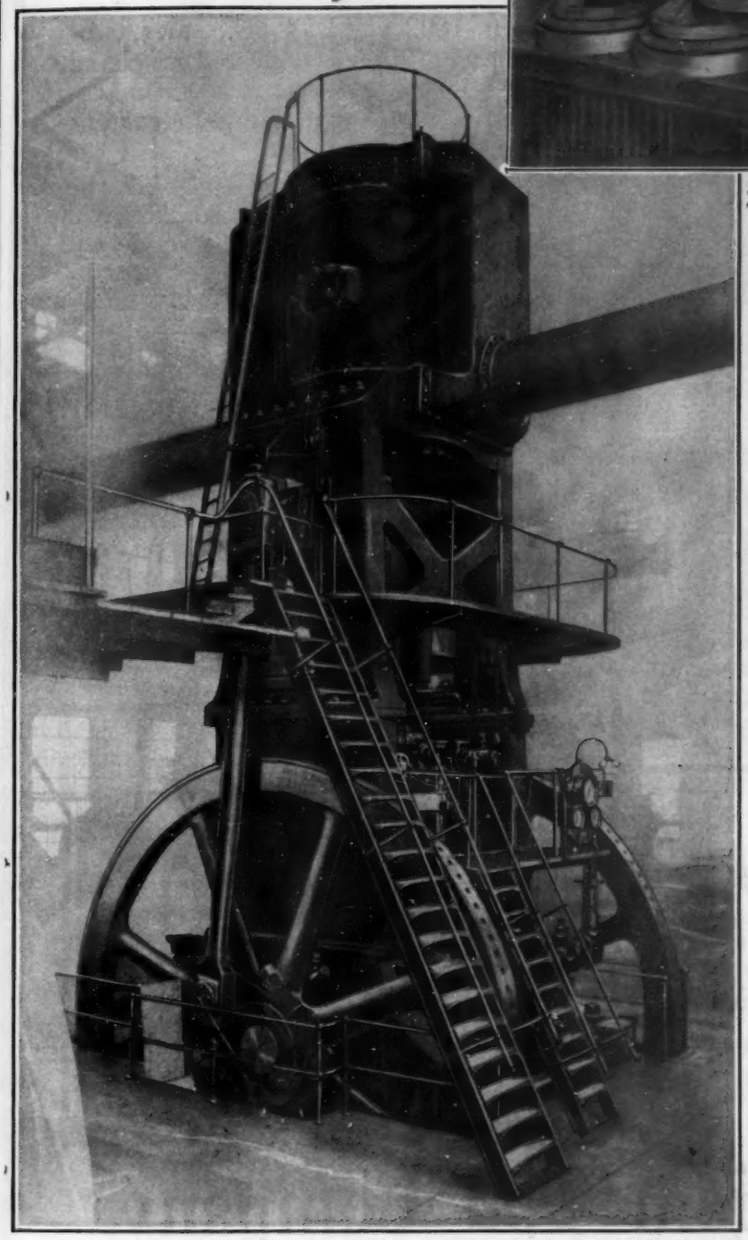
PITTSBURGH, PA.

These valves "always" open and close at the correct time.



Cut The Cost Of Pig Iron

by increasing the output with your present equipment.

Mesta Plate Valves

[IVERSEN PATENT]

make possible much higher blowing engine speeds than were heretofore used; they do it with increased economy and reliability.

NO Valve Gear
Lubrication
Leakage
Adjustments
Attendance
Repairs

RESULT:

Uniform operation of blast furnace and increased output.

Send for Bulletin "H."

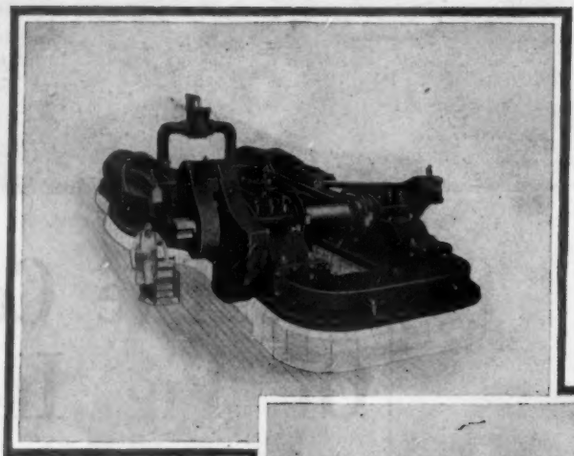
The Mesta Machine Company are equipping existing blowing engines of various makes with air heads containing Mesta plate valves.

MESTA MACHINE COMPANY
PITTSBURGH, PA.

Works: "Mesta" Station, P. R. R., West Homestead, Pa.

Twenty-two Years of Development of

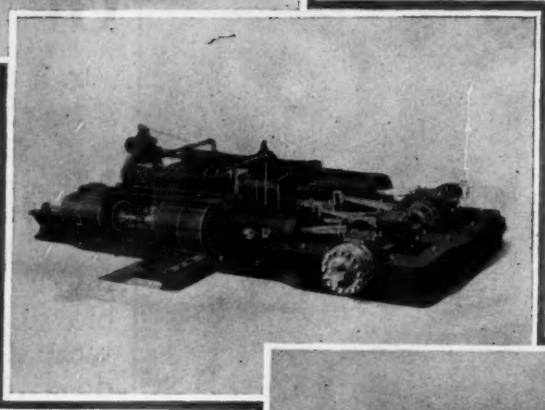
Reversing Engines



In 1892 we built the first two-bearing direct connected reversing engine, a design that was a marked advance over the then current practice.

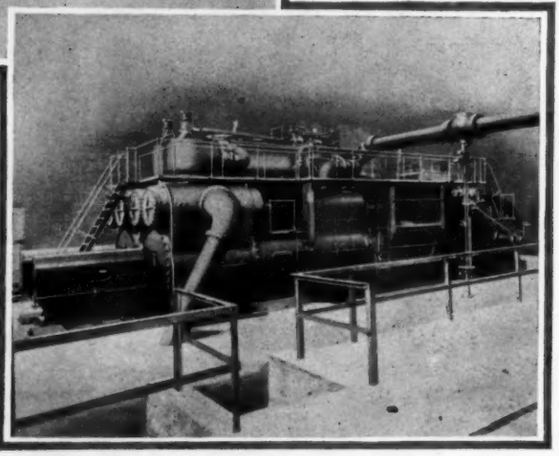
In 1905 we designed and built the first commercially successful twin tandem compound reversing engine establishing a type that is used very generally.

Installed in 1892 at Ohio Works of The Carnegie Steel Company, and rolled 6,809,100 tons of steel.



Installed at the works of the Bethlehem Steel Co., Illinois Steel Co., Carnegie Steel Co. and Republic Iron & Steel Co.

In 1913 we installed at the Brier Hill Steel Company's plant the latest development of reversing engines which embodies a number of novel features that increase economy.



The William Tod Company

Established 1856

YOUNGSTOWN, OHIO

Pioneer Builders of Mill Engines

Rolling Mills Special Machinery Hydraulic Forging Presses

Iron and Brass Castings

A Norton Grinding Machine

and Some of Its Work

"It operates as smoothly as the most expensive watch, and gives a mirror-like surface to the rolls, thereby increasing their efficiency," is how the 20" x 96" Norton Grinding Machine, shown in the accompanying illustration, is characterized at the plant of the Weirton Steel Co., Weirton, W. Va., where it is installed.

The chilled rolls in the foreground, used on mills for rolling bright-finished, cold-rolled strip steel were ground on the Norton Grinding Machine. The Weirton Steel Co. grinds rolls of the following sizes on this machine: 16" diameter, 20" face; 12" diameter, 16" face; 8" diameter, 10" face; and 6" diameter, 10" face. Rolls 16" in diameter are ground in from 1 to 1½ hrs.

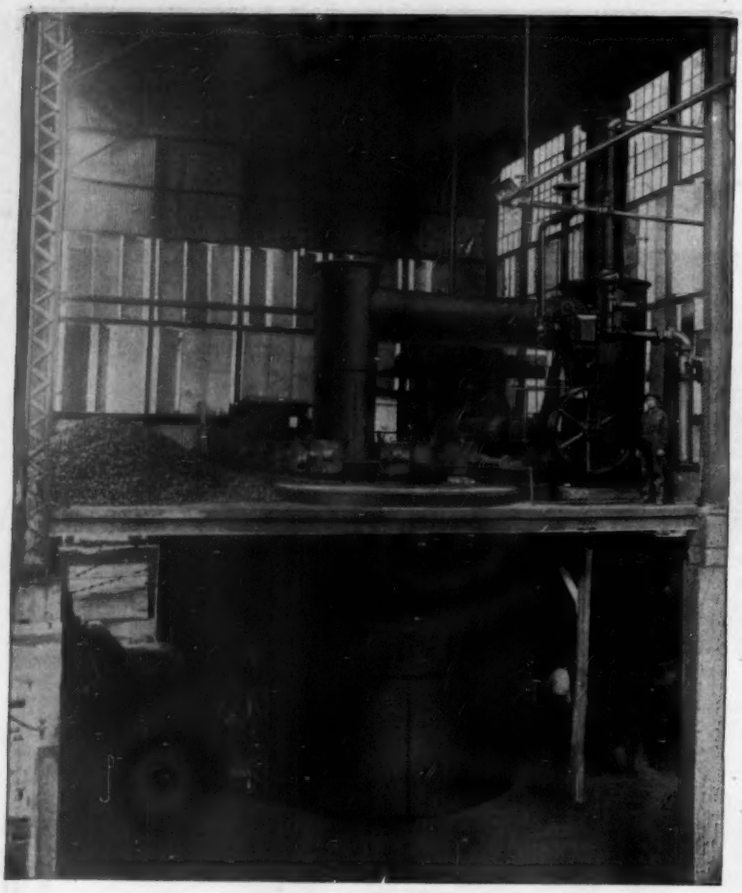
Let us tell you how a Norton Grinding Machine can serve you.

NORTON GRINDING CO. : WORCESTER, MASS.

CHICAGO STORE, 11 NO. JEFFERSON STREET

AGENTS: Vonnegut Machinery Co., Indianapolis. Robinson, Cary & Sands Co., St. Paul and Duluth. Manning, Maxwell & Moore, Inc., St. Louis. The Motch & Merryweather Machinery Co., Cleveland, Pittsburgh, Cincinnati and Detroit. Eccles & Smith Company, San Francisco, Portland, Ore., and Los Angeles. Prentiss Tool & Supply Co., New York, Boston, Rochester, Buffalo, Syracuse and Scranton. Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg and Vancouver. Alfred Herbert, Ltd., Coventry, England, Paris and Milan. Schuchardt & Schutte, Vienna, Prague, Budapest, St. Petersburg and Stockholm. The F. W. Horne Co., Tokio, Japan.

347N



The Largest Gas Producer in the World

The owners of this plant decided on the Smith System because they knew it was capable of making the biggest return on their investment.

Their 1000 H. P. Smith Power Plant, after years of operation, still stands at the head of its class. Its output today costs them less per electrical horse power year than power they can buy from the Keokuk Dam.

Their faith in the Smith System has been justified because this Smith Gas Producer replaced 3c. fuel oil in their furnaces with a saving of 50% on their investment.

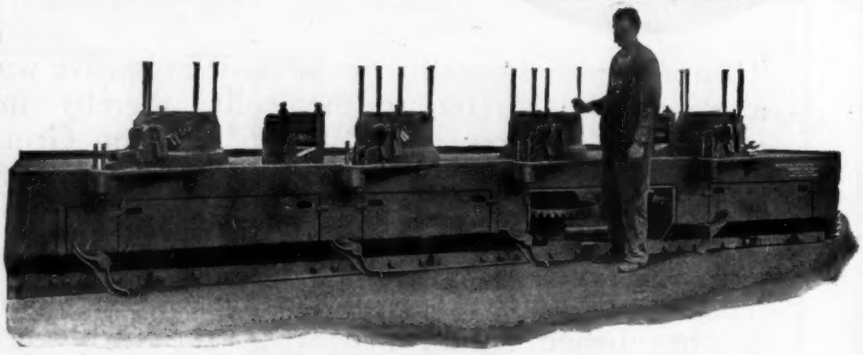
Every day you delay investigating the Smith System puts your competitor who has investigated just one day nearer lower costs and a better product.

It's your move. Catalog 9A.

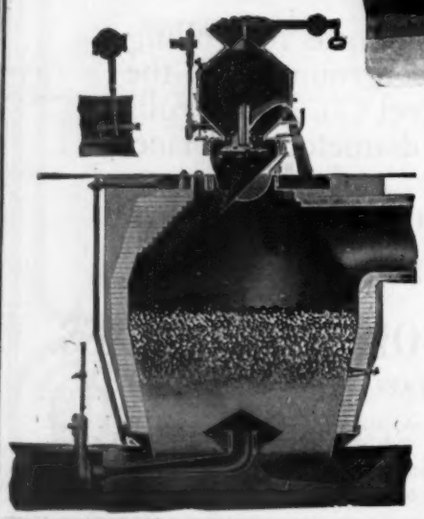
The Smith Gas Power Co.
LEXINGTON, OHIO

WIRE MILL EQUIPMENT

Friction Driven Rod Blocks driven by coil clutches enclosed within the blocks, and equipped with Automatic Safety Stops. Designed for high efficiency and low operating and maintenance costs. No drawout mechanism required.



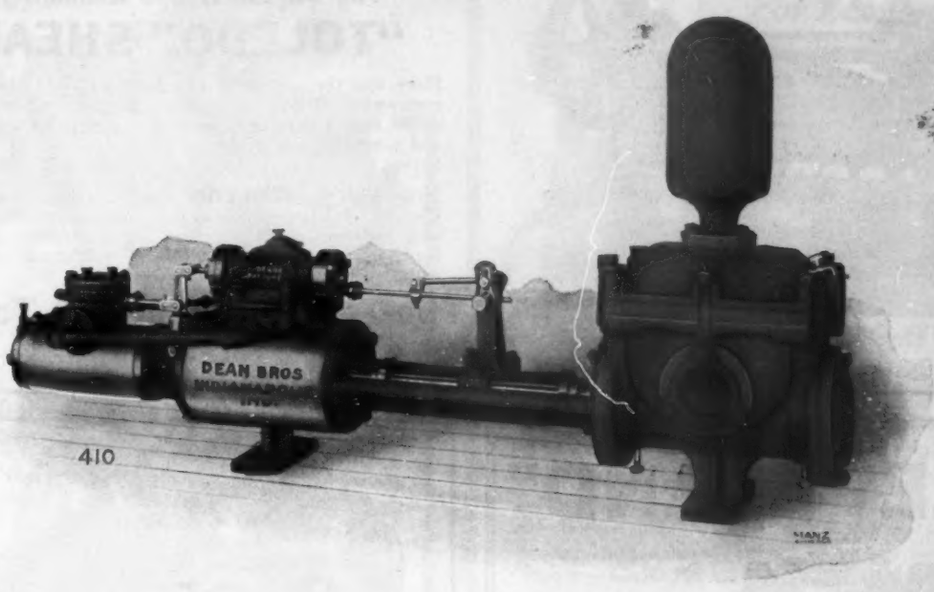
Rod Frame equipped with Carroll Friction Blocks.



Continuous Gas Producers

The Standard in Both Europe and the U. S.

Morgan Construction Co.
WORCESTER, MASS.



COMPOUND SINGLE STYLE DOUBLE ACTING STEAM PUMP

This style of pump is recommended for service where economy of fuel is important. It requires from 30 to 33 per cent less coal than high pressure pump on the same work. The valve motion secures a smooth action and admits of regulation, so as to deliver a steady supply of water. There is a by-pass with valve between high and low pressure steam chests. When valve is open it admits high pressure steam into the low pressure steam chest. This is for use when the initial steam pressure has fallen to a point where it is not possible to run compound.

DEAN BROS. STEAM PUMP WORKS. INDIANAPOLIS.

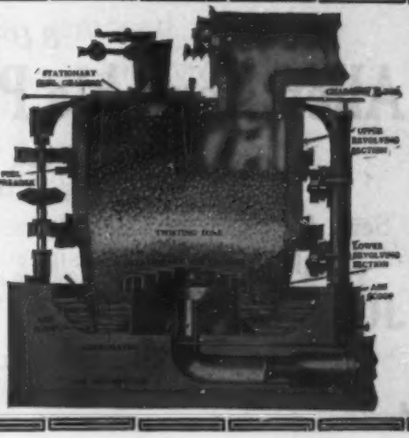
NOT IN THE PUMP TRUST.

CHAPMAN ROTARY GAS PRODUCERS

(Built by The C. & G. Cooper Co.)

Mechanically Operated Throughout

For Open Hearth Furnaces, Billet Heating, Welding, Annealing, Lime, Brick and Cement Burning, Ore Roasting, Glass Melting, and various Metallurgical and Chemical Processes. Fully described in catalogue.



Chapman Engineering Co., Mt. Vernon, Ohio

11 Broadway, New York **1323 Oliver Bldg., Pittsburg**

THE "TOLEDO" NO. 400¼ E. SHEAR
CAPACITY, ⅜" STEEL
Weight about 21,000 pounds

The Durability and Reliability of

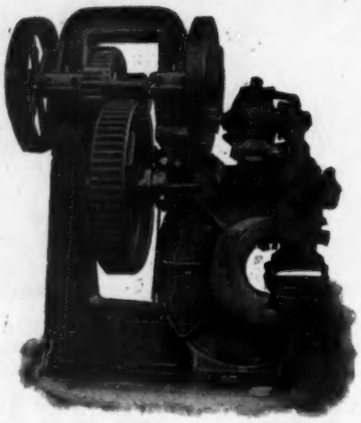
"TOLEDO" SHEARS

Have won the acclaim of manufacturers everywhere. Actual comparison of these shears with others of equal listed capacity shows such a superiority in weight, modern features, rapidity and accuracy as to make an instant appeal to experienced buyers.

Fitted with the **"TOLEDO"** quick acting, effective Block Clutch. Shafts forged from high carbon steel. Bearings have wide and long wearing surfaces and adjustment is provided for taking up the wear. All sizes—widths and capacities as required.

The Toledo Machine & Tool Co.
TOLEDO, OHIO

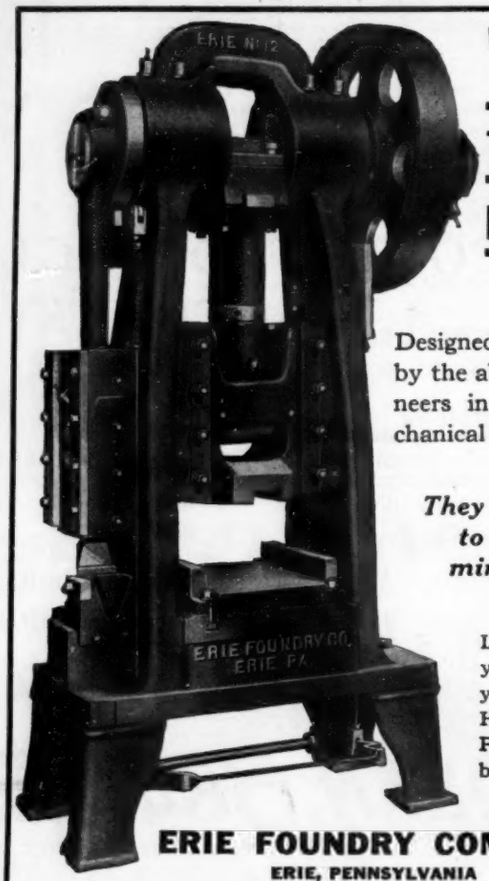
"CLEVELAND"



"Double geared, overhead drive with motor mounted on bed. A compact machine using about half the floor space of other machines of the same capacity."

The Cleveland Punch & Shear Works Co.
CLEVELAND, O.

"No. 4 Hand Book and Stock List sent on request."



"ERIE" Trimming Presses

Designed and built by the ablest engineers in the mechanical field.

They are up to the minute

Let us help you solve your Drop Hammer and Press Troubles.

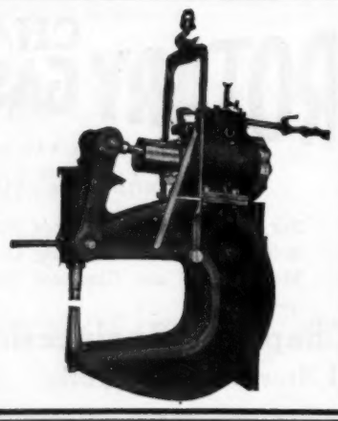
ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA

BUY AN

Allen Portable Pneumatic Riveter

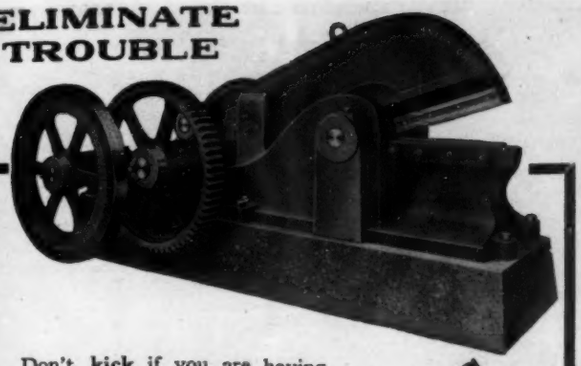
and be sure of the *fastest* and *tightest* riveting at the *lowest cost*

Send for our unequalled "Records." They will interest you.
Special riveters designed to meet all requirements.



JOHN F. ALLEN COMPANY ESTABLISHED 1872
370-372 Gerard Avenue NEW YORK
Lieber's and W. U. Codes, "Riveter."

ELIMINATE TROUBLE



Don't **kick** if you are having trouble with your shears—if cranks and countershafts are twisting or if you are having **breakdowns, delays,** etc.

IT'S YOUR OWN FAULT! You should have ordered the Double Geared Shears — the Shears that are **trouble-proof.**

CANTON SHEARS Are the Most Economical

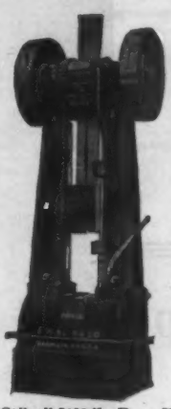
Canton Alligator Shears are all equipped with **double gears.** That is why they cost so little to operate. That is why they are the most **well balanced, smooth** and **even running** shear ever designed.

Twisted cranks or countershafts are entirely eliminated, and day after day your shop will run smoothly along.

Next time specify "CANTON!"

In the meantime get Catalog "D-15"

The Canton Foundry & Machine Co.
CANTON, OHIO



For Economical Drop Forging

"Stiles" Automatic Drop Hammers

They Work all day—every day

"Stiles" 2300 lb. Drop Hammer

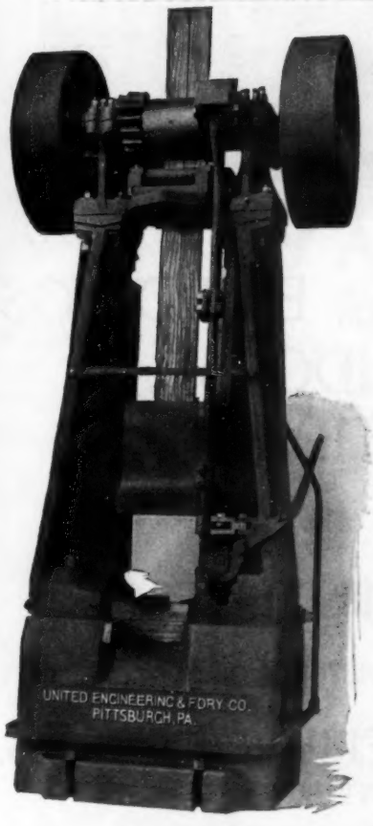
Are you using castings where you might secure better results at no greater ultimate cost by using drop forgings? Do you realize that your wastes—defective castings—labor and time lost machining poor ones—risk of breakage due to hidden defects—add to the cost of each perfect one? And the finished product—isn't it always a stronger and better looking piece when drop forged? We will be pleased to take this matter up with you.

Drop Forging Machinery Catalog 13R on request.
Builders of Complete Drop Forging Equipments.

E. W. BLISS CO., 8 Adams St. Brooklyn, N. Y.

Representatives for Chicago and Vicinity:
STILES - MORSE CO., 565 W. Washington Street, Chicago, Ill.

BLISS



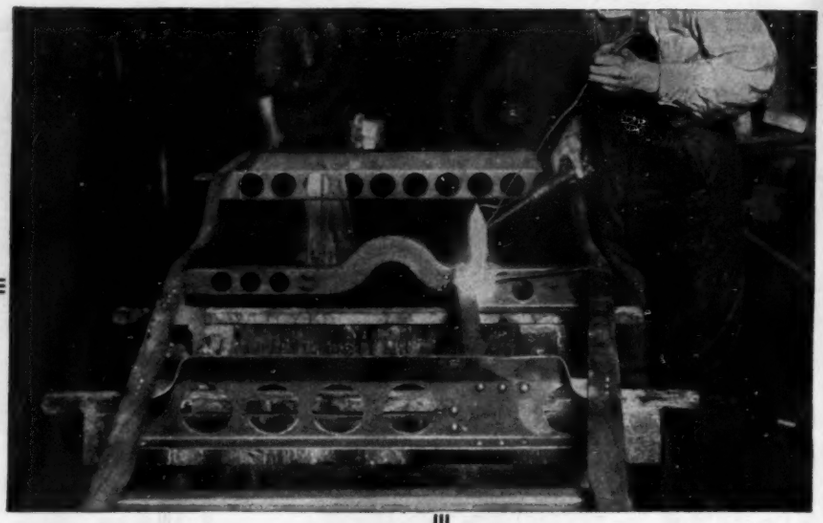
"Pittsburgh" Board Drop Hammers

Look at the simplicity. Straight front rod. Cut steel gears. Extra long and wide rolls. Steel lifter frame. Extra heavy guides. Extra long hammer. Side screws can be removed without lifting guides. From 1000 to 5000 lbs. falling weight.

Send for Illustrated Catalog.

United Engineering & Fdry. Co.
PITTSBURGH :: :: PA.

Welding Auto-Frames



Quick and Cheap

Comprehending the great economies of the ***Oxweld Process,*** manufacturers of ***automobiles*** are rapidly adopting this system for strengthening the joints of frames.

This illustration shows an 8' x 3' x 2' automobile frame, constructed of ¼" Pressed Steel and riveted, being strengthened at the joints by the ***Oxweld Process.***

On this job, ***sixteen*** welds are made in about ***six hours,*** at an expense of less than five dollars!

When welded, this frame is practically one solid piece.

There are hundreds of other opportunities for manufacturers of all classes of products, to use the ***Oxweld Process*** to very great advantage.

Do you wish to save time and money?

Do you wish to turn out stronger and better appearing work?

Then you need the "***Oxweld Process.***"

CAN'T BE EQUALED FOR REPAIRING

This incident tells the tale.

In repairing the broken frame of an ***Alco 2-Ton Truck,*** the cost of welding was $8.10, the time required, ***12 hours.*** The cost of a new frame and installing, would have been practically $100.00 and 10 days' loss of revenue—another $100.00.

Therefore on this particular job which would have cost $200.00, the ***Oxweld Process*** saved $191.10 or 95½%.

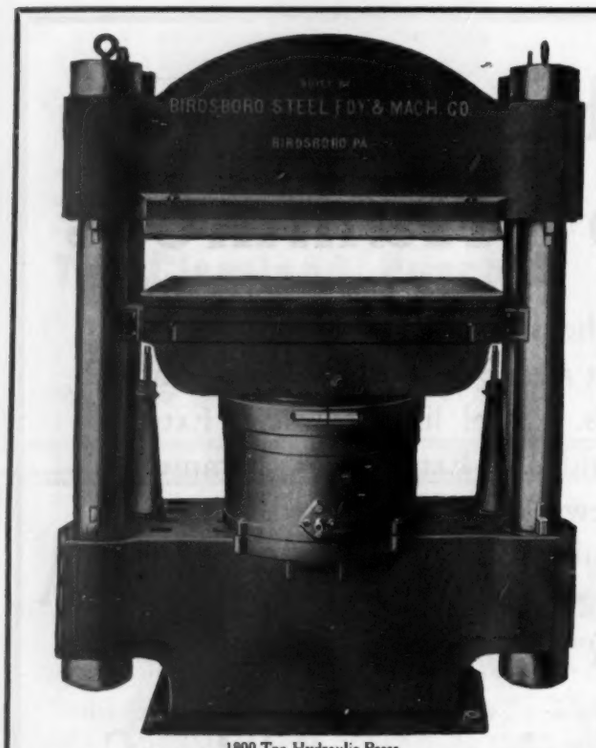
Think it over—want to know more about it?

The ideal method of ***welding, repairing, cutting scrap,*** etc.

Don't delay—***write us at once!***

OXWELD ACETYLENE COMPANY

NEWARK, N. J. CHICAGO LOS ANGELES



1800 Ton Hydraulic Press

Presses, Accumulators, Pumps, Rolling Mill Machinery, Jackson Belt Lacing Machines and Blast Furnace Castings.
Open Hearth Steel Castings, Cupola, Air Furnace and Charcoal Iron Castings.

BIRDSBORO STEEL FOUNDRY & MACHINE CO.
BIRDSBORO, PA.
Aldrich Pumps: Address—Aldrich Pump Dept., Allentown, Pa.

STEEL BUILDINGS BRIDGES *and* TIPPLES

PROMPT SHIPMENT

JOHN EICHLEAY Jr. Co.

PITTSBURGH, PA.

The Microbe More Deadly Than The Cogwheel

Twenty states have abolished this.

Typhoid, Diphtheria, Pneumonia—many are the diseases communicated by the common drinking cup.

Would you take chances with this cup in your home?

Your answer we know, and if you would not, you should not ask your men to.

Every substitution of first class mechanic by a new man means loss in productive power.

In protecting your employees' health by prohibiting the common drinking cup within your plant your profit increases.

Small investment—big return by equipping your plant with Rundle-Spence Sanitary Fountains from $1.00 to $40.00 each.

A logical addition to any bubbling fountain is a cooling device which we are prepared to furnish.

Catalogue explaining all, gladly sent on request

Rundle-Spence Mfg. Co.

63 Second St. Milwaukee, Wis.

A Double-edged Economy for every Foundry Owner

There's a **big** economy—and **you've** got to start the ball rolling to get it. Buy Sterling Wedges—you get an enormous quantity for a small price. By having a large quantity of wedges always on hand, you'll make it unnecessary for your molders to whittle wedges. The saving in molders' time pays back the cost of Sterling Wedges many times over.

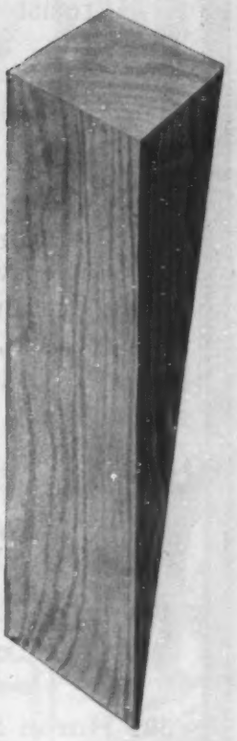
Then there's a **small** economy—we've made it for you. By installing a new machine, we've cut the production cost of our wedges 10c a hundred. We're giving **you** this saving.

1000 Sterling Hard Maple Foundry Wedges for $6.50

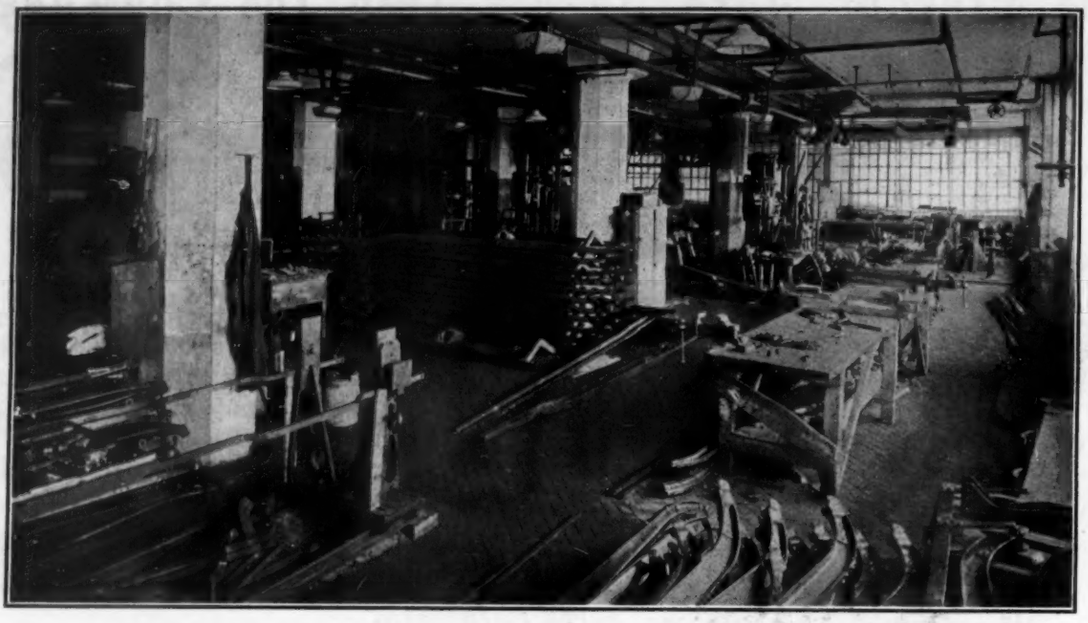
(FORMERLY $7.50)

Make this saving. Stop molders whittling away (and wasting) highly paid time. Order your first 1000 wedges today. Prices are f.o.b. factory. Kindly send check with order. We can fill your order for any quantity the same day received.

STERLING WHEELBARROW CO., 64th Ave., West Allis, Wis.



Kreolite Floors



Kreolite Block Floor in the plant of The Kinsey Manufacturing Company, Manufacturers of Parts for Overland Automobiles, Mill Architects —Mills, Rhines, Bellman & Nordhoff, Toledo, Ohio.

THE ABOVE VIEW is very evident proof of the way in which Kreolite Block Floors resist the wear and tear of the average Iron Working Shop—No maintenance expense here.

IN spite of this cutting wear which would soon demolish the average shop floor, the Kreolite Block Floor, shown above, is sufficiently smooth to allow the trucking of heavy loads with a minimum effort.

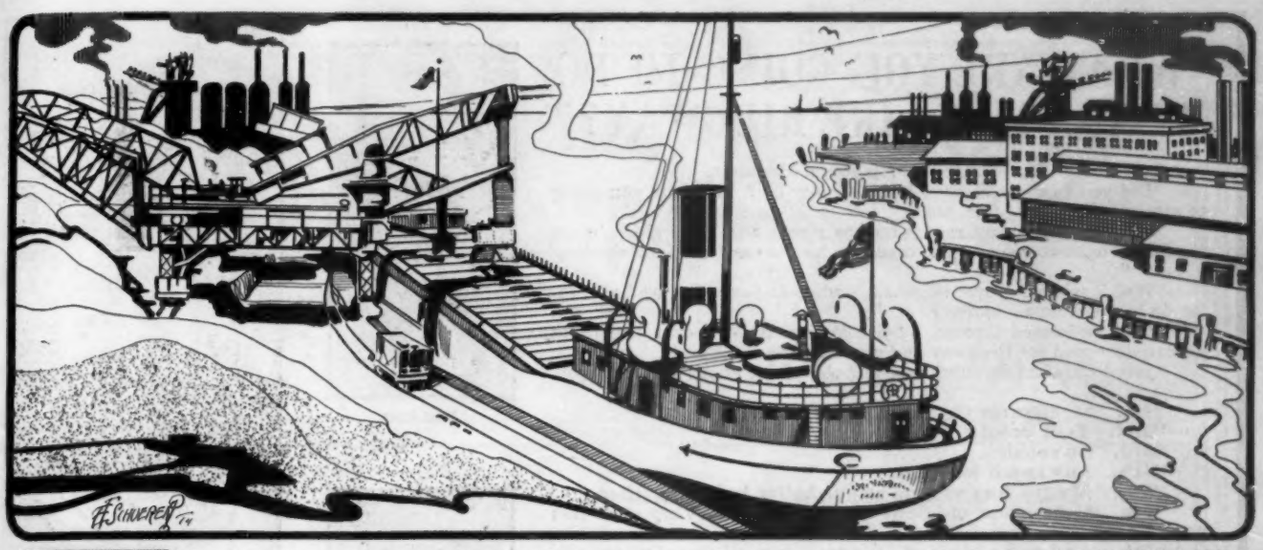
THE sharp, steel auto frames, shown in the view, are thrown on the floor with no resulting damage either to the floor or to the frames; while tons of stock are stored on different parts of the floor.

BECAUSE of the remarkable service obtained from Kreolite Block Floors now in use, many of the large industrial concerns of the country have standardized these floors in all of their plants.

We have some interesting information regarding Factory Floors. It is yours for the asking. Drop us a card today.

The Jennison-Wright Company

309 Huron Street **TOLEDO, OHIO**



CLEVELAND, OHIO, JUNE 25, 1914

THE IRON TRADE REVIEW

A weekly publication devoted to the Iron, Steel, Machinery and Foundry Industries of the United States and Canada.

Published Every Thursday by THE PENTON PUBLISHING CO., Cleveland.

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"WHAT ARE YOU GOING TO DO WITH A MAN LIKE RIDGWAY?"

Said George Worthington to His Royal Highness.

"Did you ever read such a letter in your life? How are you going to get away from it? Tell me."

"He says here, 'Any man who has steam and don't Hook 'er to the Biler ought to have a guardian, for he is a candidate for the Bug House.'"

"Well," said his Royal Highness, "what do you think we had better do in the elevator matter?"

"Do!" exclaimed George. "Gee Whizz, there is only one thing we can do—send for Ridgway and give him the business."

"Just look what he offers here in bold, plain, unmistakable words,

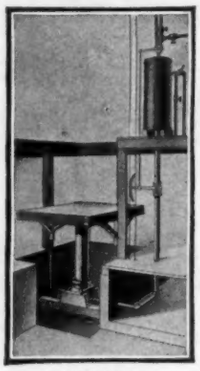
"1st. An elevator that runs at virtually no cost.
"2nd. Fool proof.
"3rd. No repairs.
"4th. Any speed we want.
"5th. Always goes so long as our boiler holds together.
"6th. Goes when old Sam shuts and banks up and has gone home.
"7th. And not a blamed cent to pay until the elevators do all this right here before our own eyes.

"And right on top of this he hands us a list of over 1000 concerns who say 'Amen' to all he says."

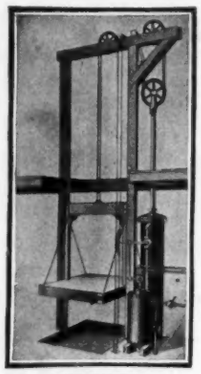
Nobody but a fool with a proposition like that before him and steam in the plant would fail to

"HOOK 'ER TO THE BILER."

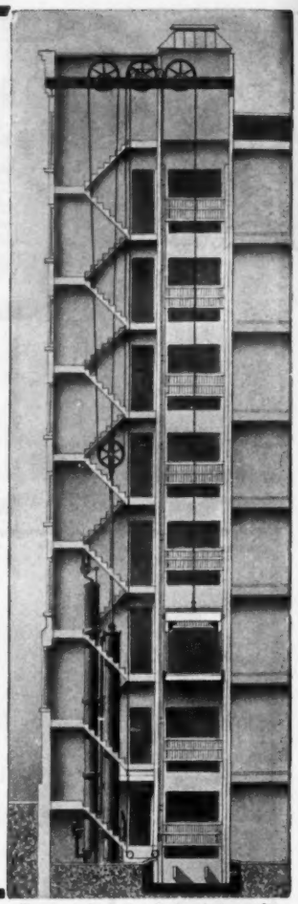
CRAIG RIDGWAY & SON
COATESVILLE, PA.
ELEVATOR MAKERS TO FOLKS WHO KNOW.



Direct Acting



Double Geared



Elevator in Large Soap Factory in Jersey City

RIVETED OR WELDED TANKS
FOR STORAGE AND FOR PRESSURE

And a General Line of

Steel Plate Construction

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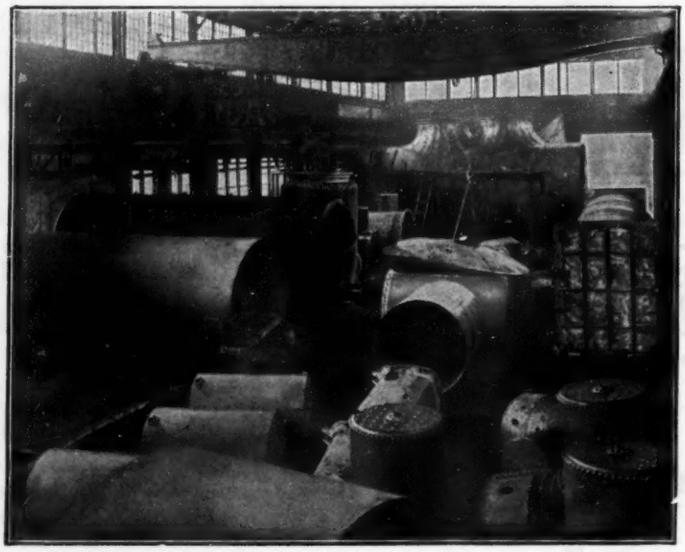

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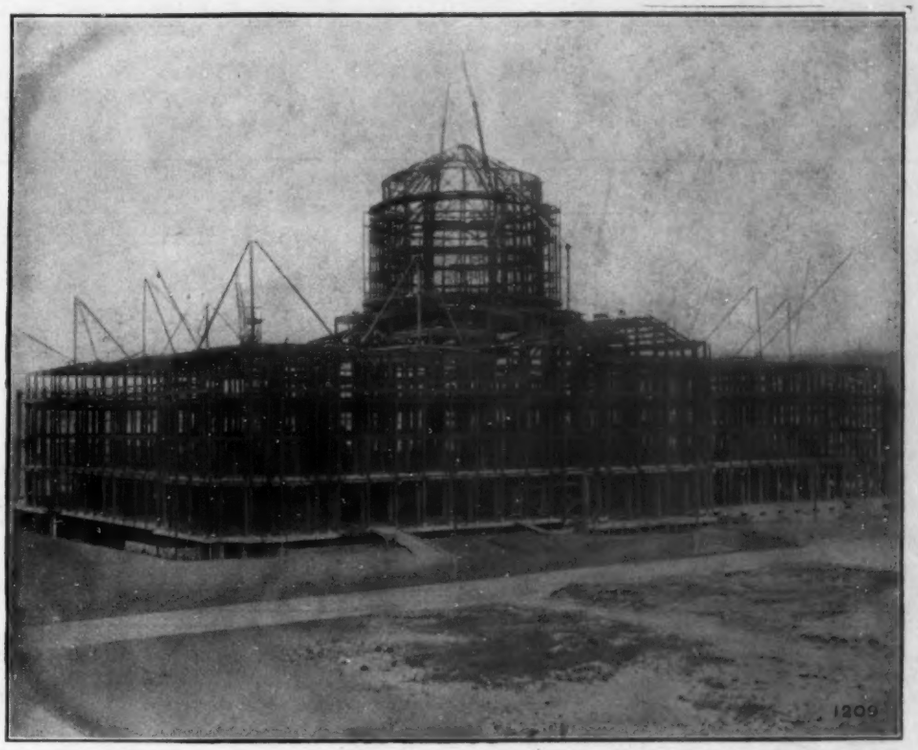

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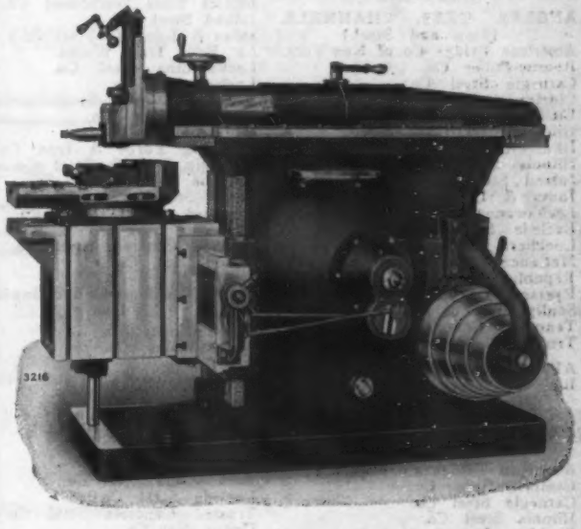

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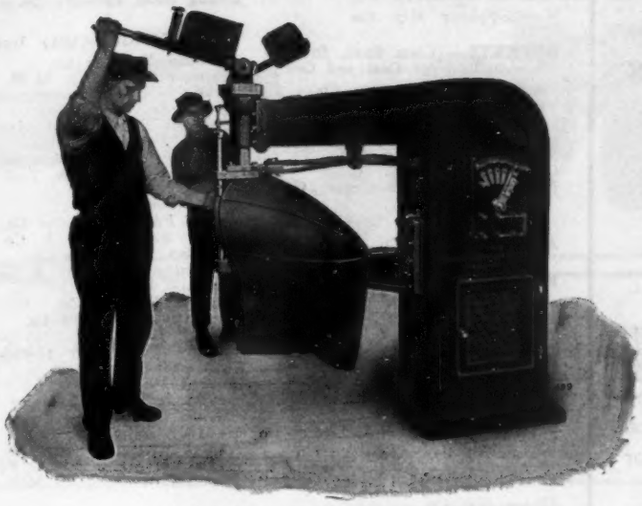

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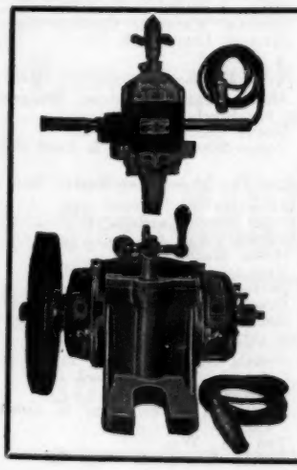

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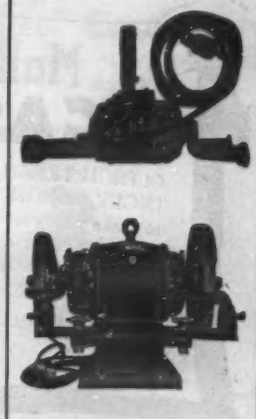

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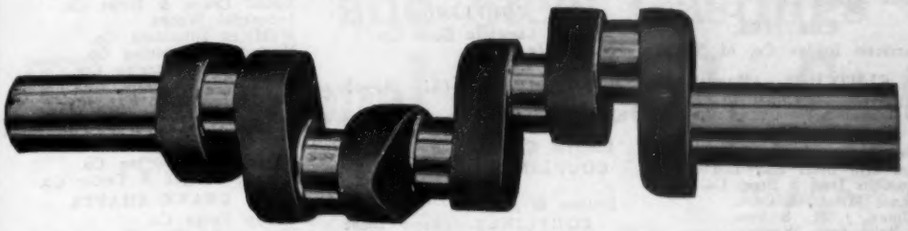

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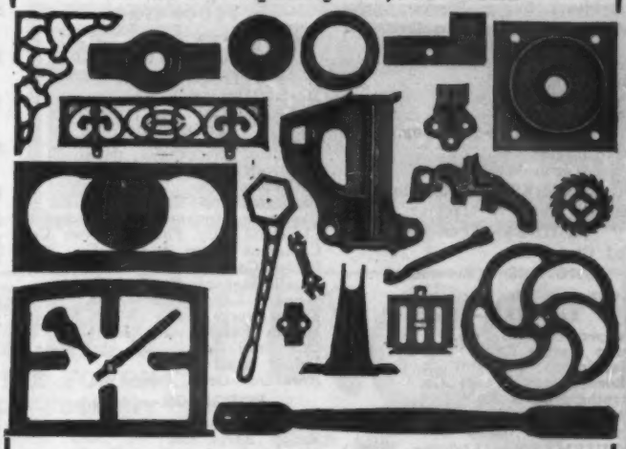

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Ayer & Lord Tie Co.
Bellefontaine Bridge & Steel Co.
Blair Engineering Co.
Carroll Foundry & Machine Co.
Eichleay, John Jr., Co.
Hartman, W. E.
Hunt, Robert W., & Co.
Ladd, James B.
Laughlin, Alex., & Co.
McClintic-Marshall Co.
McClure, Geo. W., Son & Co.
McKee, Arthur G.
Mesta Machine Co.
Morgan Engineering Co.
Rockwood Sprinkler Co.
Searing & Coultas
Smythe, The S. R. Co.
Stearns-Roger Mfg. Co.
Swindell, Wm., & Bros.
Tod Co., Wm.
Turner, Vaughn & Taylor Co.
United Engineering & Fdy. Co.
Weeks & Weeks
Wellman-Seaver-Morgan Co.
Woodmansee & Davidson, Inc.

ENGINEERS AND CONTRACTORS.—(By-Product Coke Ovens.)
Hartman, W. E.

ENGINEERS.—(Consulting.)
Weeks & Weeks

ENGINES.—(Blowing.)
Mackintosh, Hemphill & Co.
Tod Co., Wm.

ENGINES.—(Corliss.)
Cooper, C. & G., Co.
Mesta Machine Co.
Providence Engrg. Works.

ENGINES.—(Gas, Gasoline and Oil.)
Cooper, C. & G., Co.
Mesta Machine Co.
Struthers-Wells Co.
Tod Co., Wm.

ENGINES.—(Hoisting.)
Dake Engine Co.
Vulcan Iron Works

ENGINES.—(Pneumatic.)
Detroit Hoist & Machine Co.

ENGINES.—(Pumping.)
Tod Co., Wm.

ENGINES.—(Reversing.)
Mesta Machine Co.

ENGINES.—(Steam.)
Cooper, C. & G., Co.
Dake Engine Co.
Mackintosh, Hemphill & Co.
Phoenix Iron Works Co.
Struthers-Wells Co.
Tod Co., Wm.
Vulcan Iron Works.

EQUIPMENT.—(Lighting Plant.)
Smith Gas Power Co., The

EQUIPMENT.—(Rolling Mill.)
Bertsch & Co.
Carroll Foundry & Machine Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Morgan Construction Co.
Morgan Engineering Co.
Tod Co., Wm.
United Engineering & Fdy. Co.

EQUIPMENT.—(Welded Chain, Wire and Wire Nail Mills—Complete.)
Morgan Construction Co.
Turner, Vaughn & Taylor Co.

EYEBARS.
American Bridge Co. of N. Y.

EXTRACTORS.—(Tar.)
Smith Gas Power Co., The

FACINGS.—(Foundry.)
Dixon, Jos., Crucible Co.

FENCE GATES.
American Steel & Wire Co.

FENCE POSTS.
Ayer & Lord Tie Co.
Jennison-Wright Co., The

FENCES.—(Woven Wire.)
American Steel & Wire Co.

FENCING.
Cambria Steel Co.
Youngstown Sheet & Tube Co.

FERRO-MANGANESE.
Blackwell, Geo. G., & Sons, Ltd.
Crocker Bros.
Mohr, J. J., & Son.
Pickands, Brown & Co.
Rogers, Brown & Co.
Samuel, Frank.

FERRO-SILICON.
Blackwell, Geo. G., & Sons, Ltd.
Crocker Bros.
Mohr, J. J., & Son.
Pickands, Brown & Co.
Rogers, Brown & Co.
Samuel, Frank.
Tennessee Coal, Iron & R. R. Co.

FILES.
Barnett, G. & H., Co.
Disston & Sons, Inc., Henry.
Montgomery & Co.
Nicholson File Co.

FILTERS.
Kennicott Co., The

FITTINGS.—(Pipe.)
Illinois Malleable Iron Co.
National Tube Co.
Pittsburgh Piping & Equip. Co.
Pittsburgh Valve, Fdy. & Const. Co.
United Engrg. & Fdy. Co.

FLANGES.
Dart, E. M., Mfg. Co.
Hubbard Steel Foundry Co.
National Tube Co.

FLASKS.
Sterling Wheelbarrow Co.

FLAT WIRE—FLAT COLD ROLLED STEEL.
American Steel & Wire Co.

FLOORING.—(Bridge.)
Youngstown Iron & Steel Co.

FLOORING.—(Creosoted Wood.)
Ayer & Lord Tie Co.
Jennison-Wright Co., The

FLUOR-SPAR.
Rogers, Brown & Co.

FLY WHEELS.
Jones & Laughlin Steel Co.
Mesta Machine Co.
Tod Co., Wm.

FORGINGS.
American Bridge Co. of N. Y.
American Iron & Steel Mfg. Co.
Bethlehem Steel Co.
Carnegie Steel Co.
Champion Machine & Forging Co.
Cleveland City Forge & Iron Co.
Columbus Forge & Iron Co.
Eccles Co., Richard.
Ingalls-Shepard Forging Co.
Jones & Laughlin Steel Co.
Kropp Forge Co.
Martin Forging Co., H. J.
Otis Steel Co.
Pollak Steel Co.
Rockford Drop Forge Co.

FORGINGS.—(Auto.)
General Drop Forge Co.
Kropp Forge Co.
Martin Forging Co., H. J.

FORGINGS.—(Car and Locomotive.)
American Iron & Steel Mfg. Co.
Andrews Steel Co.
Cambria Steel Co.
Oliver Iron & Steel Co.

FORGINGS.—(Copper and Alloy Steel.)
Kropp Forge Co.
Martin Forging Co., H. J.

FORGINGS.—(Drop.)
Champion Machine & Forging Co.
Columbus Forge & Iron Co.
General Drop Forge Co.
Ingalls-Shepard Forging Co.
Martin Forging Co., H. J.
Oliver Iron & Steel Co.
Rockford Drop Forge Co.
Western Drop Forge Co.

FORGINGS AND RODS (Manganese Bronze.)
Exeter Machine Works

FOUNDRY EQUIPMENT AND SUPPLIES.—(Iron and Brass.)
Arcade Mfg. Co.
Northern Engineering Works.
Ohio Wood Preserving Co.
Paxson, J. W., Co.
Sly Mfg. Co., W. W.
Sterling Wheelbarrow Co.
Whiting Foundry Equipment Co.

FOUNTAINS.
Rundle-Spence Mfg. Co.

FURNACES.—(Annealing.)
Hagan, Geo. J.
Kenworthy, Chas. F.
Quigley Furnace & Fdy. Co.
Swindell & Bros., Wm.

FURNACES.—(Billet and Plate Heating.)
Kenworthy, Chas. F.
Quigley Furnace & Foundry Co.

FURNACES.—(Blast.)
Ladd, James B.
Mackintosh, Hemphill & Co.
McClure, Son & Co., G. W.
McKee, Arthur G.
Riter-Conley Mfg. Co.
Tod Co., Wm.
Wellman-Seaver-Morgan Co.

FURNACES.—(Crucible.)
Laughlin & Co., Alex.

FURNACES.—(Forging.)
Kenworthy, Chas. F.
Quigley Furnace & Foundry Co.

FURNACES.—(Heat Testing.)
Best, W. N.
Kenworthy, Chas. F.
Quigley Furnace & Foundry Co.

FURNACES.—(Lead, Pot and Muffle Annealing, Wire Mills.)
Morgan Construction Co.
Turner, Vaughn & Taylor Co.

FURNACES.—(Melting.)
Best, W. N.
Whiting Foundry Equipment Co.

FURNACES.—(Oil, Gas or Coke, Welding Chain Factories.)
Turner, Vaughn & Taylor Co.

FURNACES.—(Open-Hearth.)
Smythe Co., S. R.

FURNACES.—(Reheating.)
Morgan Construction Co.

FURRING.—(Metal.)
Youngstown Iron & Steel Co.

GALVANIZING.—(Custom.)
McCance Bros. Co.

GASKETS.
Erbestos Brake Lining Co.

GAGES.—(Recording and Steam.)
Bristol Co.
Brown Instrument Co.

GEAR CUTTING.
Bilgram Machine Works.
Newton Machine Tool Works.
Tod Co., Wm.

GEARS.
...llen, Edgar, American Manganese Steel Co.
Bucyrus Steel Casting Co.
Chicago Rawhide Mfg. Co.
Dake Engine Co.
Farrell Fdy. & Mach. Co.
Fawcus Machine Co.
Foote Bros. Gear & Mach. Co.
Horsburgh & Scott Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
New Process Gear Corpn.
Nuttall, R. D., Co.
Taylor-Wharton Iron & Steel Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Van Dorn & Dutton Co.

GEARS.—(Bevel.)
Chicago Rawhide Mfg. Co.
Fawcus Machine Co.
Horsburgh & Scott Co.
New Process Gear Corpn.
Nuttall, R. D., Co.
Tod Co., Wm.

GEARS.—(Cast Steel, Machine Molded.)
American Steel Foundries.
Chicago Rawhide Mfg. Co.
Horsburgh & Scott Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Nuttall, R. D., Co.
United Engrg. & Fdy. Co.

GEARS.—(Cut.)
Carroll Foundry & Machine Co.
Chicago Rawhide Mfg. Co.
Fawcus Machine Co.
Foote Bros. Gear & Mach. Co.
Horsburgh & Scott Co.
Mesta Machine Co.
Morgan Construction Co.
New Process Gear Corpn.
Nuttall, R. D., Co.
Tod Co., Wm.
Van Dorn & Dutton Co.

GEARS.—(Double Helical Cut.)
Fawcus Machine Co.
Tod Co., Wm.

GEARS.—(Rawhide.)
Chicago Rawhide Mfg. Co.
Foote Bros. Gear & Mach. Co.
Horsburgh & Scott Co.
New Process Gear Corpn.
Nuttall, R. D., Co.

GENERATORS.—(Direct and Alternating.)
Crocker-Wheeler Co.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

GLASS.—(Wire.)
Trussed Concrete Steel Co.

GRAPHITE.
Dixon, Jos., Crucible Co.

GRATES.
Green Engrg. Co.

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Turner, Vaughn & Taylor Co.

GRINDERS.—(Electrical Driven.)
Cincinnati Electrical Tool Co.
Standard Electric Tool Co.
United States Electrical Tool Co.

GRINDERS.—(Nail Machine, Knife, Wire Nail Mills.)
Turner, Vaughn & Taylor Co.

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Cleveland Pneumatic Tool Co.

GRINDING MACHINERY.—(Cylindrical.)
Norton Grinding Co.

GRINDING WHEEL STAND.—(Bench Type.)
Norton Grinding Co.

GRINDING WHEEL STAND.—(Floor Type.)
Norton Grinding Co.

HAMMERS.—(Belt-Driven.)
Beaudry & Co., Inc.
Bradley & Son, C. C.

HAMMERS.—(Drop.)
Alliance Machine Co.
Bliss, E. W., Co.
Buffalo Fdy. & Machine Co.
Chambersburg Engineering Co.
Erie Foundry Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Toledo Machine & Tool Co.
United Engineering & Fdy. Co.

HAMMERS.—(Drop Forging.)
Buffalo Foundry & Machine Co.
Toledo Machine & Tool Co.

HAMMERS.—(Foot and Power, Welded Chain Factories.)
Turner, Vaughn & Taylor Co.

HAMMERS.—(Pneumatic.)
Cleveland Pneumatic Tool Co.
Ryerson, Joseph T., & Son.

HAMMERS.—(Power.)
Beaudry & Co., Inc.
Bradley & Son, C. C.
Buffalo Foundry & Machine Co.
Cleveland Punch & Shear Works Co.
Morgan Engineering Co.
Toledo Machine & Tool Co.

HAMMERS.—(Steam.)
Buffalo Foundry & Machine Co.
Chambersburg Engineering Co.
Erie Foundry Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.

HANGERS.
Jones & Laughlin Steel Co.
New Departure Mfg. Co.
Trussed Concrete Steel Co.

HEADS.—(Dished.)
Worth Bros.

HEATERS.—(Feed Water.)
Exeter Machine Works
Shaw-Kendall Engineering Co.

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Mead-Morrison Mfg. Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Otis Elevator Co.
Pawling & Harnischfeger Co.
Toledo Bridge & Crane Co.
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Detroit Hoist & Machine Co.
Northern Engineering Works.
Ridgway, Craig, & Son.
Whiting Foundry Equipment Co.

HOISTS.—(Portable.)
Canton Fdy. & Mach. Co.

HOOPS AND BANDS.
Alton Steel Co.
Bourne-Fuller Co., The
Carnegie Steel Co.
Illinois Steel Co.
Jones & Laughlin Steel Co.
McCance Bros. Co.
Ryerson, Joseph T., & Son.
Scully Steel & Iron Co.

HORSE SHOES AND CALKS.
American Steel & Wire Co.

HOSE.—(Pneumatic.)
Cleveland Pneumatic Tool Co.

IGNITION WIRE.
American Steel & Wire Co.

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Brown Instrument Co.
Smith Gas Power Co.

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Pickands, Brown & Co.

IRON.—(Cutting Apparatus.)
Newton Mach. Tool Works, Inc.

IRON.—(Forging.)
Thomas Iron Co.
Wickwire Steel Co.

IRON.—(Foundry.)
Thomas Iron Co.
Wickwire Steel Co.

IRON.—(Malleable.)
Thomas Iron Co.

IRON.—(Pig.)
Baird & West.
Barnum-Richardson Co.
Bourne-Fuller Co., The
Brier Hill Steel Co.
Carnegie Steel Co.
Columbus Iron & Steel Co.
Crocker Bros.
Domhoff & Joyce Co., The
Eaton, Rhodes & Co.
Globe Iron Co.
Hanna & Co., M. A.
Hillman & Son, J. H.
Illinois Steel Co.
La Belle Iron Works.
McKeefrey & Co.
Mitchell-Diggins Iron Co.
Mohr, J. J., & Son.
Pickands, Brown & Co.
Pickands, Mather & Co.
Republic Iron & Steel Co.
Rogers, Brown & Co.
Samuel, Frank.
Snyder & Co., W. P.
Stewart Iron Co., Ltd.
Superior Charcoal Iron Co.
Tenn. Coal, Iron & R. R. Co.
Thomas Furnace Co.
Thomas Iron Co.
Upson Nut Co.
Wickwire Steel Co.

IRON.—(Staybolt.)
American Iron & Steel Mfg. Co.
Bourne-Fuller Co., The

IRON AND STEEL.—(Galvanized.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co., The
Brier Hill Steel Co.
Inland Steel Co.
McCalla, Harold.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Ryerson, Jos. T., & Son.
Youngstown Sheet & Tube Co.

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Bourne-Fuller Co., The
Scully Steel & Iron Co.

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IRON WORK.—(Structural.)
Western Drop Forge Co.

JACKS.—(Hydraulic.)
Watson-Stillman Co.

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Lackawanna Steel Co.

KEYS AND COTTERS.—(Machine.)
Standard Gauge Steel Co.

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Baker Bros.
Mitts & Merrill

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Elec. Locomotive & Car Co.
Northern Engineering Works.
Riter-Conley Mfg. Co.
Whiting Foundry Equipment Co.

LAMPS.—(Arc.)
Westinghouse Elec. & Mfg. Co.

LAMPS.—(Incandescent.)
Westinghouse Elec. & Mfg. Co.

LATH.—(Expanded Metal.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Brier Hill Steel Co., The
Newport Rolling Mill Co.
Trussed Concrete Steel Co.
Youngstown Iron & Steel Co.

LATHES.
Cincinnati Iron & Steel Co.
Jones & Lamson Mach. Co.
Manning, Maxwell & Moore, Inc.
Niles-Bement-Pond Co.

LATHES.—(Roll.)
Mesta Machine Co.
Morgan Construction Co.
Niles-Bement-Pond Co.
Youngstown Fdy. & Mach. Co.

LATHES.—(Turret.)
Jones & Lamson Mach. Co.
New Britain Mach. Co.
Niles-Bement-Pond Co.

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National Tube Co.

LINING.—(Brake.)
Erbestos Brake Lining Co.

LINING.—(Cupola.)
Louisville Fire Brick Works.

LINING.—(Forge and Furnace.)
Harbison-Walker Refractories Co.

LOCOMOTIVES.
Atlas Car & Mfg. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.
Vulcan Iron Works.

LOCOMOTIVES.—(Electric.)
Atlas Car & Mfg. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

LOCOMOTIVES.—(Industrial.)
Vulcan Iron Works.

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LUMBER.—(Creosoted.)
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Vulcan Iron Works.

MACHINERY. — (Coal and Ash Handling.)
Exeter Machine Works
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Newton Mch. Tool Works, Inc.

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Wellman-Seaver-Morgan Co.

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Mesta Machine Co.
Morgan Engineering Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

MACHINERY.—(Galvanizing.)
Erie Foundry Co.

MACHINERY.—(Gear Cutting.)
Bilgram Machine Works.
Cincinnati Gear Cutting Machine Co.
Cincinnati Shaper Co.
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MACHINERY.—(Grinding.)
Blake & Johnson Co.
Landis Tool Co.
Newton Mch. Tool Works, Inc.
Norton Grinding Co.

MACHINERY.—(Hydraulic.)
Hydraulic Press Mfg. Co.
Mesta Machine Co.
Tod Co., Wm.
United Engrg. & Fdy Co.
Watson-Stillman Co.

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Cincinnati Milling Mach. Co.
Espen-Lucas Machine Works
Foote Bros. Gear & Mach. Co.
Newton Mch. Tool Wks., Inc.
Niles-Bement-Pond Co.
Warner & Swasey Co.

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Bucyrus Co.
McMyler Interstate Co.
Stearns-Roger Mfg. Co.
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Taylor-Wilson Mfg. Co.

MACHINERY.—(Nut Facing.)
Newton Mch. Tool Wks., Inc.

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Standard Engineering Co.
Taylor-Wilson Mfg. Co.
United Engrg. & Fdy. Co.
Williams Tool Co.

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Curtis & Curtis Co.

MACHINERY.—(Planing.)
Newton Mch. Tool Wks., Inc.

MACHINERY.—(Power Transmission.)
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Mesta Machine Co.
Westinghouse Elec. & Mfg. Co.

MACHINERY.—(Rolling Mill.)
Alliance Machine Co.
Bertsch & Co.
Birdsboro Steel Fdy. & Mch. Co.
Blake & Johnson Co.
Carroll Foundry & Machine Co.
Farrell Foundry & Machine Co.
Fawcus Machine Co.
Garrison, A., Foundry Co.
Hyde Park Fdy. & Machine Co.
Johnston & Jennings Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Morgan Construction Co.
Morgan Engineering Co.
Newbold, R. S., & Son Co.
Standard Engineering Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Wellman-Seaver-Morgan Co.
Wheeling Mold & Fdy. Co.
Youngstown Fdy. & Mch. Co.

MACHINERY.—(Screw Making, Automatic.)
Cook Co., Asa S.

MACHINERY.—(Second Hand.)
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Ryerson, Jos. T., & Son.

MACHINERY.—(Shearing.)
Bertsch & Co.
Erie Foundry Co.
Mesta Machine Co.

MACHINERY.—(Sheet Metal Working.)
Bertsch & Co.
Bliss Co., E. W.

MACHINERY.—(Shovel.)
Bertsch & Co.

MACHINERY.—(Spike and Rivet.)
Youngstown Fdy. & Mch. Co.

MACHINERY.—(Tapping.)
Baker Bros.

MACHINERY.—(Thread Rolling.)
Blake & Johnson Co.

MACHINERY.—(Tin House.)
Birdsboro Steel Fdy. & Mch. Co.
United Engineering & Fdy. Co.

MACHINERY.—(Wire.)
Blake & Johnson Co.

MACHINERY.—(Wire Drawing, Wire and Rivet Works.)
Morgan Construction Co.
Turner, Vaughn & Taylor Co.

MACHINERY.—(Wire Galvanizing, Wire Tinning, Wire Nails.)
Turner, Vaughn & Taylor Co.

MACHINERY.—(Wire Nail.)
National Machinery Co.

MACHINERY.—(Wire Nails and Staples, Wire Nail Mills.)
Kilby Mfg. Co.
Turner, Vaughn & Taylor Co.

MACHINISTS.—(Special Machinery.)
Bethlehem Steel Co.
Blake & Johnson Co.
Bliss Co., E. W.
Carroll Foundry & Machine Co.
Fawcus Machine Co.
Foote Bros. Gear & Mach. Co.
Kilby Mfg. Co.
Manning, Maxwell & Moore, Inc.
Mesta Machine Co.
Morgan Engineering Co.
Providence Engineering Works
Tod Co., Wm.
Toledo Machine & Tool Co.

MAGNESITE.—(Dead Burned.)
American Refractories Co.
Stowe-Fuller Co.

MAGNETS.—(Lifting.)
Cutler-Hammer Clutch Co.
Electric Controller & Mfg. Co.

METAL.—(Antimony, Copper.)
Blackwell, Geo. G., Sons & Co.

METAL.—(Babbitt.)
U. S. Reduction Co.

METAL.—(Expanded.)
Youngstown Iron & Steel Co.

METAL.—(Heat Treatment Of.)
Steel Improvement Co.

METAL.—(Infusion Process For.)
Steel Improvement Co.

METALS.—(Non-Ferrous.)
Titanium Alloy Mfg. Co.
U. S. Reduction Co.

METAL.—(Perforated.)
Erdle Perforating Co.
Hendrick Mfg. Co.

METAL.—(Washed.)
Brier Hill Steel Co., The

METALLURGISTS.
Steel Improvement Co.

MILLS.—(Billet.)
Morgan Construction Co.

MILLS.—(Blooming, Universal, Plate, Sheet, Tin, Bar.)
Mesta Machine Co.

MILLS.—(Continuous Rolling.)
Morgan Construction Co.

MILLS.—(Wire Complete Equipment.)
Blake & Johnson Co.
Morgan Construction Co.
Turner, Vaughn & Taylor Co.

MOLDING MACHINES.
Pridmore, Henry E.

MOLDS.—(Ingot.)
Carnegie Steel Co.
Marshall Foundry Co.

MOTORS.—(Air.)
Detroit Hoist & Machine Co.
Westinghouse Elec. & Mfg. Co.

MOTORS.—(Electric D. C. and A. C.)
Crocker-Wheeler Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

MOTORS.—(Mill.)
General Electric Co.
Westinghouse Elec. & Mfg. Co.

NAILS.
American Steel & Wire Co.
Cambria Steel Co.
Jones & Laughlin Steel Co.
La Belle Iron Works.
Newport Rolling Mill Co.
Youngstown Sheet & Tube Co.

NIPPLES.
National Tube Co.

NUTS.
American Bridge Co. of N. Y.
American Iron & Steel Co.
Atlas Bolt & Screw Co.
Bourne-Fuller Co.
Gary Screw & Bolt Co.
Lockhart Iron & Steel Co.
Milton Mfg. Co.
Oliver Iron & Steel Co.
Pittsburgh Screw & Bolt Co.
Republic Iron & Steel Co.
Russell, Burdsall & Ward Bolt & Nut Co.
Scully Steel & Iron Co.
Upson Nut Co.

NUTS.—(Hot Pressed.)
American Iron & Steel Mfg. Co.
Bourne-Fuller Co.
Milton Mfg. Co.
Republic Iron & Steel Co.
Upson Nut Co.

OIL STORAGE TANKS.
Kennicott Co., The

ORE.—(Chrome.)
Blackwell, Geo. G., Sons & Co., Ltd.
Samuel, Frank.

ORE.—(Iron.)
Blackwell, Geo. G., Sons & Co., Ltd.
Breitung, E. N., & Co.
Hanna, M. A., & Co.
Hillman & Son, J. H.
La Belle Iron Works.
Oglebay, Norton & Co.
Pickands, Brown & Co.
Pickands, Mather & Co.
Snyder & Co., W. P.
Tod-Stambaugh Co.

OVENS.—(By-Product Coke Ovens.)
Coal Distillation Co.
Gas Machinery Co., The

OVENS.—(Coke.)
Coal Distillation Co.
Gas Machinery Co., The

OVENS.—(Core.)
Quigley Furnace & Foundry Co.
Whiting Fdy. Equipment Co.

PAINT.
Dixon, Jos., Crucible Co.

PANS.—(Grinding.)
Phillips & McLaren Co.

PANS.—(Lathe.)
New Britain Machine Co.

PANS.—(Shop.)
American Bridge Co. of N. Y.

PATTERNS.
Arcade Mfg. Co.
Buffalo Fdy. & Mch. Co.
Canton Brass & Mch. Co.
Standard Pattern Wks. Co., The

PERFORATING.—(Sheet Metal, Automatic, Screen Work.)
Turner, Vaughn & Taylor Co.

PILING.—(Creosoted.)
Ayer & Lord Tie Co.
Jennison-Wright Co., The

PILING.—(Steel Sheet Interlocking.)
Carnegie Steel Co.
Jones & Laughlin Steel Co.
Lackawanna Steel Co.

PINIONS.
Mesta Machine Co.
Nuttall, R. D., Co.
Tod Co., Wm.
Van Dorn & Dutton Co.

PINIONS.—(Mill, Cut.)
Tod Co., Wm.

PINIONS.—(Rawhide.)
Chicago Rawhide Mfg. Co.
Horsburgh & Scott Co.
New Process Gear Corpn.
Nuttall, R. D., Co.

PINS.—(Knuckle and Brake.)
Champion Rivet Co.
Oliver Iron & Steel Co.

PINS.—(Pivot.)
Champion Rivet Co.

PIPE.
Bourne-Fuller Co.
Central Tube Co.
Cox & Co., J. Fillmore.
Inland Steel Co.
La Belle Iron Works.
Mark Mfg. Co.
National Tube Co.
Pittsburgh Valve Foundry & Construction Co.
Shaw-Kendall Engrg. Co.
Struthers-Wells Co.
U. S. Cast Iron Pipe & Fdy. Co.
Youngstown Sheet & Tube Co.

PIPE.—(Drive, Iron and Steel.)
Republic Iron & Steel Co.
Youngstown Sheet & Tube Co.

PIPE.—(Acid, Alkali, Rust-Proof.)
Duriron Castings Co.

PIPE.—(Iron and Steel, Galvanized.)
Mark Mfg. Co.
Youngstown Sheet & Tube Co.

PIPE.—(Line, Iron and Steel.)
Youngstown Sheet & Tube Co.

PIPE.—(Riveted Steel.)
American Bridge Co. of N. Y.
Cambria Steel Co.
Kennicott Co., The
Riter-Conley Mfg. Co.
Struthers-Wells Co.

PIPE.—(Wrought Iron.)
Bourne-Fuller Co.
Pittsburgh Piping & Equip. Co.
Youngstown Sheet & Tube Co.

PLANERS.
Cincinnati Planer Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Manning, Maxwell & Moore, Inc.
Niles-Bement-Pond Co.
Ryerson, Jos. T., & Son.

PLANTS.—(Electric Lighting.)
Smith Gas Power Co., The

PLANTS.—(Powdered Coal.)
Quigley Furnace & Foundry Co.

PLATES.
Allegheny Steel Co.
American Rolling Mill Co.
Bourne-Fuller Co.
Cambria Steel Co.
Carnahan Tin Plate & Sheet Co.
Illinois Steel Co.
Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
La Belle Iron Works.
Lackawanna Steel Co.
Newport Rolling Mill Co.
Otis Steel Co.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Ryerson, Jos. T., & Son.
Taylor, N. & G., Co.
Tenn. Coal, Iron & R. R. Co.
Trumbull Steel Co.
Trussed Concrete Steel Co.
Wood, Alan, Iron & Steel Co.
Worth Bros. Co.
Youngstown Sheet & Tube Co.

PLATES.—(Boiler and Tank.)
American Rolling Mill Co.
Andrews Steel Co.
Bourne-Fuller Co.
Brown-Wales Co.
La Belle Iron Works.
Newport Rolling Mill Co.
Otis Steel Co.
Portsmouth Steel Co.
Ryerson & Son, Jos. T.

PLATES.—(Armor.)
Trussed Concrete Steel Co.

PLATES.—(Felloe.)
Wrought Washer Mfg. Co.

PLATES.—(Floor, Rolled Steel.)
Carnegie Steel Co.
National Tube Co.
Trussed Concrete Steel Co.
Wood, Alan, Iron & Steel Co.

PLATES.—(Name.)
Chandler Co.

PLATES.—(Sheared.)
American Rolling Mill Co.
Bourne-Fuller Co.
Cambria Steel Co.
Carnegie Steel Co.
Cincinnati Iron & Steel Co.
Illinois Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.

PLATES.—(Terne.)
Carnahan Tin Plate & Sheet Co.
Trumbull Steel Co.

PLATES.—(Tie.)
Illinois Steel Co.
Lackawanna Steel Co.

PLATES.—(Universal.)
Bourne-Fuller Co.
Carnegie Steel Co.
Illinois Steel Co.
La Belle Iron Works.
Youngstown Sheet & Tube Co.

PLATE WORK.
Western Drop Forge Co.

POINTERS.—(Wire Rod, Wire Mills.)
Morgan Construction Co.
Turner, Vaughn & Taylor Co.

POLES.—(Gin.)
American Bridge Co. of N. Y.

POTS.—(Galvanizing.)
American Bridge Co. of N. Y.

POULTRY NETTING.
American Steel & Wire Co.

PRESSES.
Birdsboro Steel Fdy. & Mch. Co.
Bliss, E. W., Co.
Chambersburg Engrg. Co.
Cleveland Punch & Shear Works Co.
Hydraulic Press Mfg. Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Ryerson, Jos. T., & Son.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Wood, R. D., Co.

PRESSES.—(Bending and Flanging.)
Chambersburg Engrg. Co.
Mesta Machine Co.

PRESSES.—(Drill, Heavy Duty.)
Niles-Bement-Pond Co.

PRESSES.—(Drill, Multiple Spindle.)
Niles-Bement-Pond Co.

PRESSES.—(Forging.)
Chambersburg Engrg. Co.
Mesta Machine Co.
Morgan Engineering Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Watson-Stillman Co.

PRESSES.—(Forming and Flanging.)
Hydraulic Press Mfg. Co.

PRESSES.—(Hydraulic.)
Chambersburg Engrg. Co.
Hydraulic Press Mfg. Co.
Mesta Machine Co.
Niles-Bement-Pond Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Watson-Stillman Co.

PRESSES.—(Power.)
Toledo Machine & Tool Co.

PRESSES.—(Rail Straightening.)
Hydraulic Press Mfg. Co.
Tod Co., Wm.

PRESSES.—(Steam, Sleeves, Runner Brick, Nozzles and Tuyeres, Fire Brick Works.)
Turner, Vaughn & Taylor Co.

PRESSES.—(Toggle Drawing.)
Toledo Machine & Tool Co.

PRESSES.—(Trimming.)
Erie Foundry Co.
Massillon Fdy. & Mach. Co.
Toledo Machine & Tool Co.

PRODUCERS.—(Gas.)
Chapman Engineering Co.
Hagan Co., Geo J.
Morgan Construction Co.
Smith Gas Power Co., The
Struthers-Wells Co.
Wellman-Seaver-Morgan Co.

PULLEYS.
Jones & Laughlin Steel Co.

PUMPS.
Aldrich Pump Dept.
Dean Bros. Steam Pump Wks.
Deming Co.
Hydraulic Press Mfg. Co.
Providence Engineering Works.
Tod Co., Wm.

PUMPS.—(Bank.)
Dean Bros. Steam Pump Works.

PUMPS.—(Boiler Feed.)
Aldrich Pump Department.
Dean Bros. Steam Pump Works.
Deming Co.
Providence Engineering Co.
Vulcan Iron Works.

PUMPS.—(Centrifugal.)
Duriron Castings Co.
Providence Engineering Works.

PUMPS.—(Compound.)
Dean Bros. Steam Pump Works.

PUMPS.—(Deep Well.)
Dean Bros. Steam Pump Works.
Deming Co.

PUMPS.—(Electric Driven.)
Aldrich Pump Department.
Dean Bros. Steam Pump Works.
Deming Co.

PUMPS.—(Elevator.)
Aldrich Pump Department.
Dean Bros. Steam Pump Works.

PUMPS.—(Hydraulic.)
Aldrich Pump Department.
Chambersburg Engrg. Co.
Dean Bros. Steam Pump Works.
Deming Co.
Hydraulic Press Mfg Co.

PUMPS.—(Mine.)
Aldrich Pump Department.
Dean Bros. Steam Pump Works.
Deming Co.

PUMPS.—(Steam.)
Dean Bros. Steam Pump Works.

PUMPS.—(Vacuum.)
Buffalo Fdy. & Machine Co.
Dean Bros. Steam Pump Works.
Deming Co.
Mesta Machine Co.

PUNCHES AND SHEARS.
Allen, John F., Co.
Alliance Machine Co.
Bertsch & Co.
Birdsboro Steel Foundry & Machine Co.
Bliss, E. W., Co.
Canton Foundry & Machine Co.
Cleveland Punch & Shear Wks. Co.
Mackintosh, Hemphill & Co.
Massillon Fdy. & Machine Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Ryerson, Jos. T., & Son.
Scully Steel & Iron Co.
Standard Bridge Tool Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Watson-Stillman Co.
Wood, R. D., & Co.

PUNCHES.—(Hand.)
Bertsch & Co.
Bourne-Fuller Co.

PUNCHES.—(Hydraulic.)
Bertsch & Co.
Mesta Machine Co.
Tod Co., Wm.
Watson-Stillman Co.

PUNCHES.—(Multiple.)
Bertsch & Co.
Bliss Co., E. W.
Mackintosh, Hemphill & Co.

PUNCHES.—(Pneumatic.)
Allen, John F., Co.

PUNCHES.—Structural and Boiler Work.)
Richards Co., I. P.

PYROMETERS.
Bristol Co.
Brown Instrument Co.
Stupakoff Laboratories.

RACKS.—(Steel or Tool.)
New Britain Mach. Co.

RAIL BONDS.
American Steel & Wire Co.

RAILS.
Bourne-Fuller Co.
Cambria Steel Co.
Carnegie Steel Co.
Cincinnati Frog & Switch Co., The
Hyman-Michaels Co.
Illinois Steel Co.
Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
Jones & Laughlin Steel Co.
Lackawanna Steel Co.
National Iron & Steel Co.
Tenn. Coal, Iron & R. R. Co.

REAMERS.
Morse Twist Drill & Mach. Co.

REELS.—(Wood and Iron, Wire Mills.)
Morgan Construction Co.
Turner, Vaughn & Taylor Co.

REGENERATORS.
Coal Distillation Co.

REGULATORS.—(Speed.)
Cutler-Hammer Mfg. Co.

RIVETERS.—(Hydraulic.)
Chambersburg Engrg Co.
Mackintosh, Hemphill & Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Wood & Co., R. D.

RIVETERS.—(Pneumatic.)
Allen, John F., Co.
Cleveland Pneumatic Tool Co.
Ryerson, Jos. T., & Son.

RIVETERS.—(Structural, Boiler, Ship.)
American Iron & Steel Mfg. Co.
Bourne-Fuller Co.
Carlin, Anthony
Champion Rivet Co.
Gary Screw & Bolt Co.
Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
Lockhart Iron & Steel Co.
Oliver Iron & Steel Co.
Pittsburgh Screw & Bolt Co.
Progressive Mfg. Co.
Republic Iron & Steel Co.
Russell, Burdsall & Ward Bolt & Nut Co.
Ryerson, Jos. T., & Son
Scully Steel & Iron Co.
Upson Nut Co.

RODS.—(Drill, Polished.)
Bourne-Fuller Co.

RODS.—(Iron and Steel.)
American Iron & Steel Mfg. Co.
Jones & Laughlin Steel Co.
Upson Nut Co.
Youngstown Sheet & Tube Co.

RODS.—(Straightened and Cut.)
Youngstown Sheet & Tube Co.

RODS.—(Wire.)
American Steel & Wire Co.

ROLL GRINDING MACHINE.
Norton Grinding Co.

ROLLS.—(Bending and Straightening.)
Bertsch & Co.
Morgan Engineering Co.
United Engrg. & Fdy. Co.

ROLLS.—(Sand Chilled and Steel.)
American Steel Foundries.
Birdsboro Steel Fdy. & Mach. Co.
Farrell Fdy. & Mach. Co.
Garrison Fdy. & Mach. Co.
Hyde Park Fdy. & Mach. Co.
Mesta Machine Co.
National Roll & Foundry Co.
Seaman, Sleeth & Co.
United Engrg. & Fdy. Co.
Youngstown Fdy. & Mach. Co.

ROOFING.—(Corrugated.)
American Rolling Mill Co.
Amer. Sheet & Tin Plate Co.
Brier Hill Steel Co.
Inland Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Trumbull Steel Co.
Youngstown Sheet & Tube Co.

ROOFING.—(Iron and Steel.)
American Rolling Mill Co.
Amer. Sheet & Tin Plate Co.
Brier Hill Steel Co.
Inland Steel Co.
Massillon Rolling Mill Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Trumbull Steel Co.
Wood, Alan, Iron & Steel Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

ROOFING TIMBER.—(Creosoted.)
Ayer & Lord Tie Co.
Jennison-Wright Co., The

RUNNING BALANCE INDICATING MACHINE.
Norton Grinding Co.

RUNWAYS.—(Crane.)
American Bridge Co. of N. Y.

SAND.—(Molding.)
Newport Sand Bank Co.
Ohio Sand Co.

SAND BLAST ACCESSORIES.
Dolben & Johnson

SAND BLAST.—(Chilled Shot for Use In.)
Globe Steel Co.

SAND BLAST EQUIPMENT.
Paxson Co., J. W.
Sly, W. W., Mfg. Co.

SANITARY DRINKING FOUNTAINS.
Rundle-Spence Mfg. Co.

SASH.—(Casement.)
Trussed Concrete Steel Co.

SAWS.—(Band.)
Disston, Henry & Sons, Inc.

SAWS.—(Cold Metal.)
Disston, Henry & Sons, Inc.
Espen-Lucas Mach. Works.
Mackintosh, Hemphill & Co.
Newton Mach. Tool Wks., Inc.

SAWS.—(Hack.)
Disston, Henry & Sons, Inc.

SAWS.—(Hot.)
Disston, Henry & Sons, Inc.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
United Engrg. & Fdy. Co.

SAWS.—(Milling.)
Disston, Henry, & Sons, Inc.

SCREENS.
Hendrick Mfg. Co.

SCREWS.
American Iron & Steel Mfg. Co.
Atlas Bolt & Screw Co.
Gary Screw & Bolt Co.
Milton Mfg. Co.
Pittsburgh Screw & Bolt Co.
Progressive Mfg. Co.
Republic Iron & Steel Co.
Russell, Burdsall & Ward Bolt & Nut Co.

SEMI UNIVERSAL GRINDING MACHINE.
Norton Grinding Co.

SEPARATORS.—(Centrifugal Oil.)
American Tool & Machine Co.
National Separator & Mach. Co.

SEPARATORS.—(Magnetic.)
American Grondal Co.
Cutler-Hammer Clutch Co.

SEPARATORS.—(Steam and Oil.)
Pittsburgh Valve Fdy. & Cons. Co.

SHAFTING.
Bourne-Fuller Co.
Cincinnati Iron & Steel Co.
Cumberland Steel Co.
Jones & Laughlin Steel Co.
Pittsburgh Shaft'g Co. of Detroit.
Republic Iron & Steel Co.
Scully Steel & Iron Co.
Standard Gauge Steel Co.
Union Drawn Steel Co.

SHAFTING.—(Cold Drawn or Rolled.)
Bourne-Fuller Co.
Republic Iron & Steel Co.

SHAFTING.—(Cold Rolled Steel.
American Steel & Wire Co.

SHAFTING.—(Turned.)
Bourne-Fuller Co.
Pittsburgh Shaft'g Co. of Detroit.

SHAPERS.
Cincinnati Shaper Co.
Cleveland Punch & Shear Wks. Co.
Manning, Maxwell & Moore, Inc.
Newton Mch. Tool Wks., Inc.
Niles-Bement-Pond Co.

SHAPES.—(Agricultural.)
Carnegie Steel Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
Laclede Steel Co.
Republic Iron & Steel Co.

SHAPES.—(Steel, Structural and Special Rolled.)
Bourne-Fuller Co.
Cambria Steel Co.
Illinois Steel Co.
Pittsburgh Shaft'g Co. of Detroit.
Scully Steel & Iron Co.

SHEARS.—(Angle and Plate.)
Bertsch & Co.
Canton Fdy. & Machine Co.

SHEARS.—(Billet, Bloom and Slab.)
Garrison, A., Foundry Co.
Mackintosh, Hemphill & Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

SHEARS.—(Doubling.)
Mesta Machine Co.

SHEARS.—(Flying and Bar.)
Mackintosh, Hemphill & Co.
Morgan Construction Co.

SHEAR KNIVES.
L. & I. J. White Co.

SHEARS.—(Lever.)
Bertsch & Co.
Mesta Machine Co.
United Engrg. & Fdy. Co.
Watson-Stillman Co.
Youngstown Fdy. & Mch. Co.

SHEARS.—(Portable.)
Watson-Stillman Co.

SHEARS.—(Portable, Motor Driven.)
Canton Foundry & Machine Co.

SHEARS.—(Power.)
Canton Foundry & Machine Co.
Toledo Machine & Tool Co.

SHEARS.—(Scrap, Alligator, Wire and Wire Nail Mills.)
Canton Foundry & Machine Co.
Turner, Vaughn & Taylor Co.
Youngstown Fdy. & Mch. Co.

SHEARS.—(Squaring.)
Bertsch & Co.
Bliss Co., E. W.
Erie Foundry Co.
Garrison, A., Foundry Co.
Mesta Machine Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

SHEARS.—(Vertical.)
Bertsch & Co.
Mesta Machine Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

SHEETS.—(Black Steel.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Canton Sheet Steel Co.
Cincinnati Iron & Steel Co.
Inland Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Ryerson, Joseph T., & Son.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Blue Annealed.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Andrews Steel Co.
Bourne-Fuller Co.
Brier Hill Steel Co., The
Cincinnati Iron & Steel Co.
Inland Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Corrugated.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Canton Sheet Steel Co.
Cincinnati Iron & Steel Co.
Inland Steel Co.
La Belle Iron Works.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Ryerson & Son, Jos. T.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Trumbull Steel Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Dead Soft for Stamping.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co., The
Canton Sheet Steel Co.
Inland Steel Co.
Massillon Rolling Mill Co.
Portsmouth Steel Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Deep Drawing Stock.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Inland Steel Co.
Massillon Rolling Mill Co.
Youngstown Iron & Steel Co.

SHEETS.—(Galvanized.)
Allegheny Steel Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Canton Sheet Steel Co.
Inland Steel Co.
La Belle Iron Works.
Newport Rolling Mill Co.
Parkersburg Iron & Steel Co.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Ryerson & Son, Jos. T.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Trumbull Steel Co.
Wood, Alan, Iron & Steel Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Iron and Steel.)
Allegheny Steel Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Canton Sheet Steel Co.
Disston & Sons, Inc., Henry
Illinois Steel Co.
Illinois Steel Co., Wareh'se Dept.
Illinois Steel Warehouse Co.
Inland Steel Co.
La Belle Iron Works
Massillon Rolling Mill Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Ryerson, Jos. T., & Son
Scully Steel & Iron Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Tenn. Coal, Iron & R. R. Co.
Trumbull Steel Co.
Wood, Alan, Iron & Steel Co.
Worth Bros. Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Open-Hearth.)
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co., The
Canton Sheet Steel Co.
Inland Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Trumbull Steel Co.
Youngstown Iron & Steel Co.

SHEETS.—(Pickled and Cold Rolled.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Canton Sheet Steel Co.
Inland Steel Co.
Massillon Rolling Mill Co.
Trumbull Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Polished.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Canton Sheet Steel Co.
Carnahan Tin Plate & Sheet Co.
Massillon Rolling Mill Co.
Newport Rolling Mill Co.

SHEETS.—(Roofing.)
Canton Sheet Steel Co.

SHEETS.—(Steel Box Annealed.)
American Sheet & Tin Plate Co.
Brier Hill Steel Co., The
Canton Sheet Steel Co.
Portsmouth Steel Co.
Trumbull Steel Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEET WORK.
Western Drop Forge Co.

SHELVING.—(Steel.)
New Britain Mach. Co.

SHINGLES.—(Metal.)
American Rolling Mill Co.
Trumbull Steel Co.

SHOVELS.—(Steam.)
Bucyrus Co.
Thew Automatic Shovel Co.

SIFTERS.—(Sand.)
Arcade Mfg. Co.
Whiting Fdy. Equipment Co.

SINTERING.
American Grondal Co.

SLABS.
Andrews Steel Co.
Cambria Steel Co.
La Belle Iron Works
Portsmouth Steel Co.
Youngstown Sheet & Tube Co.

SLABS.—(Sheet.)
Inland Steel Co.
La Belle Iron Works
Lackawanna Steel Co.
Tenn. Coal, Iron & R. R. Co.
Youngstown Sheet & Tube Co.

SLEEPERS.—(Creosoted.)
Ayer & Lord Tie Co.
Jennison-Wright Co., The

SPECIAL STEEL PLATE WORK.
Kennicott Co., The

SPECIALTIES.—(Steam.)
National Tube Co.

SPIEGELEISEN.
Pickands, Brown & Co.

SPIKES.
American Iron & Steel Mfg. Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
McCance Bros. Co.
Republic Iron & Steel Co.

SPIKES.—(Screw.)
American Iron & Steel Mfg. Co.
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Lackawanna Steel Co.
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Rockwood Sprinkler Co.

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Jones & Laughlin Steel Co.
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Laclede Steel Co.
Lockhart Iron & Steel Co.
Milne, A., & Co.
Otis Steel Co.
Pittsburgh Shaft'g Co. of Detroit.
Portsmouth Steel Co.
Republic Iron & Steel Co.
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Upson Nut Co.
Wood, Alan, Iron & Steel Co.
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STEEL.—(Axle, Automobile, Mining Car.)
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Union Drawn Steel Co.
United Steel Co.

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Newport Rolling Mill Co.
Pittsburgh Cold Rolled Steel Co.
Scully Steel & Iron Co.

STEEL.—(Cold Drawn.)
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Standard Gauge Steel Co.
Union Drawn Steel Co.
United Steel Co.

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United Steel Co.

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Brier Hill Steel Co., The
Cambria Steel Co.
Illinois Steel Co.
Inland Steel Co.
Portsmouth Steel Co.
Union Drawn Steel Co.
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Milne, A., & Co.

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United Steel Co.

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Kennicott Co., The

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Bourne-Fuller Co.
Calumet Steel Co.
Cambria Steel Co.
Carnegie Steel Co.
Cincinnati Iron & Steel Co.
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Firth-Sterling Steel Co.
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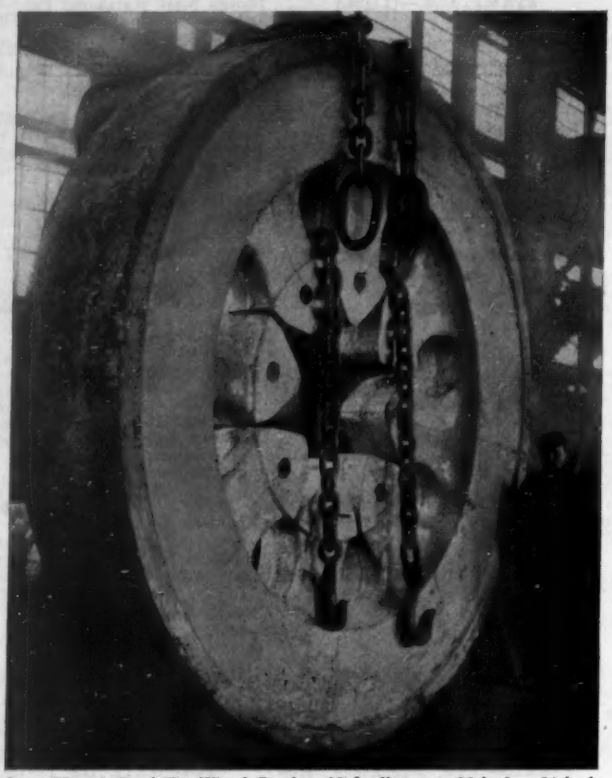

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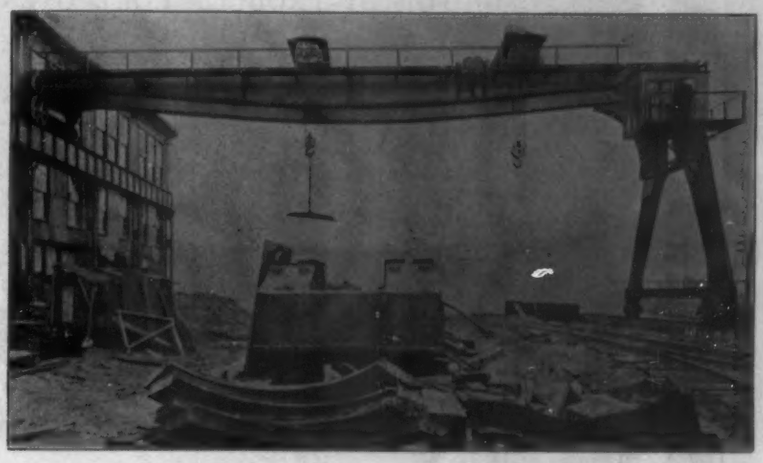

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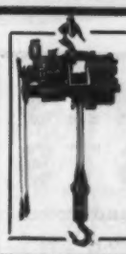

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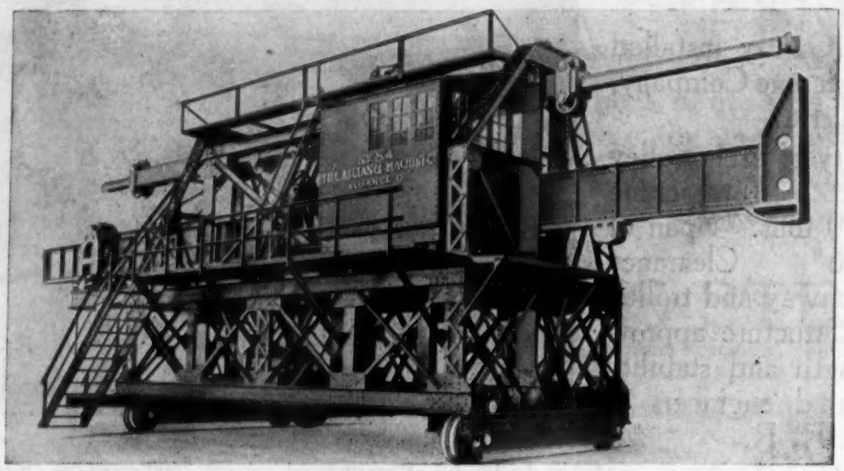

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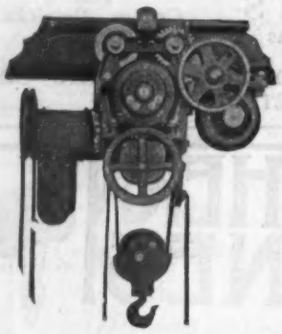

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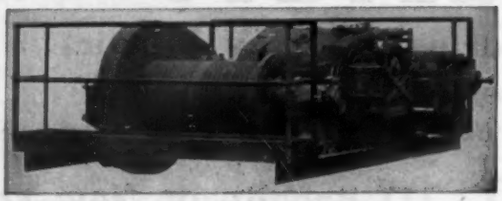

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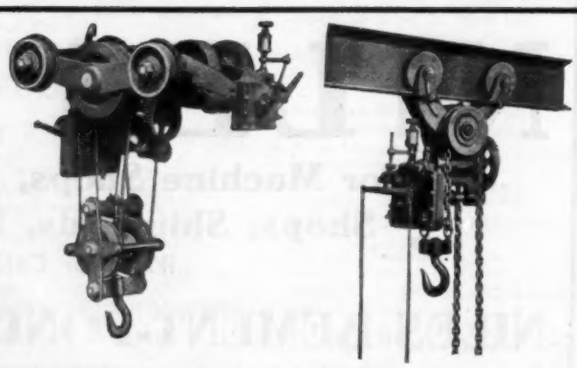

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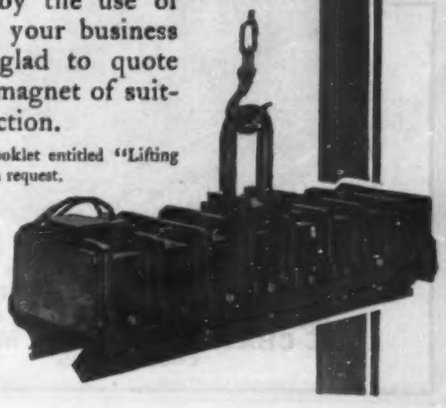

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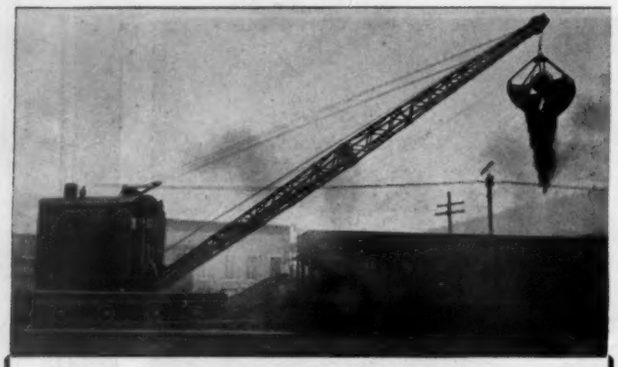

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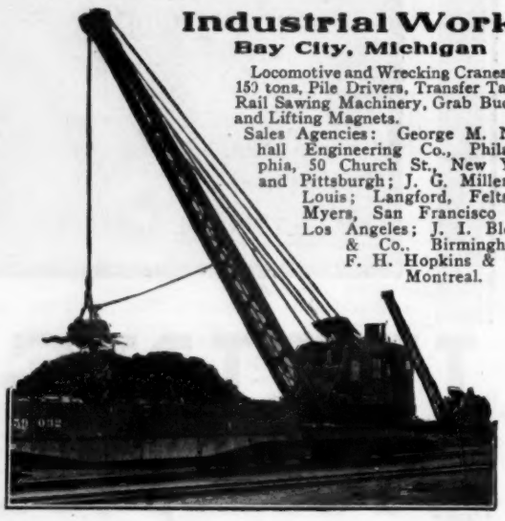

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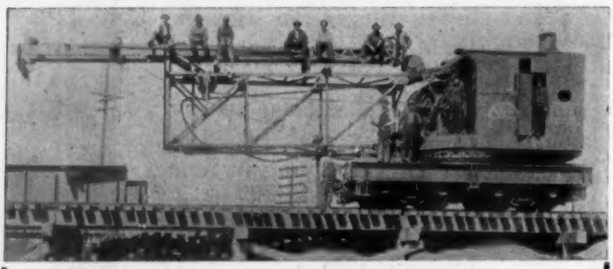

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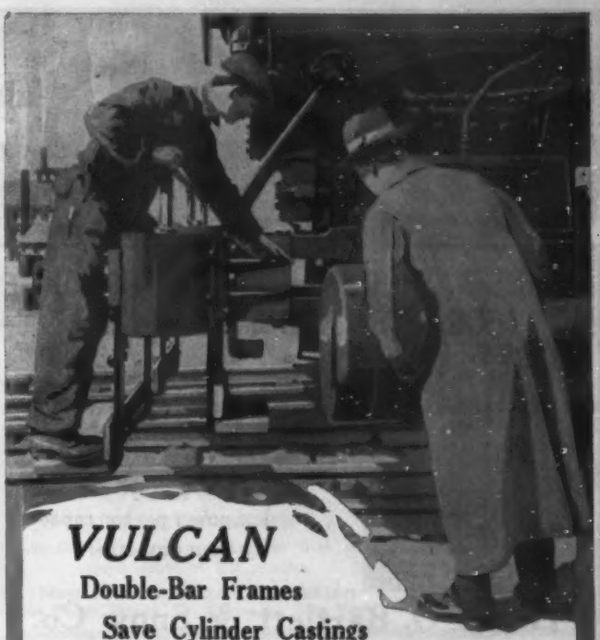

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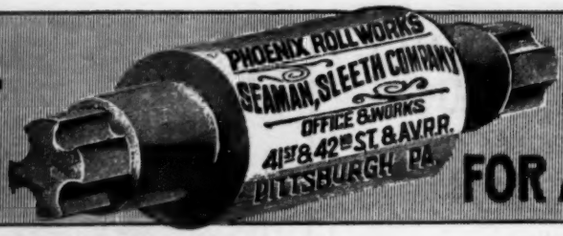

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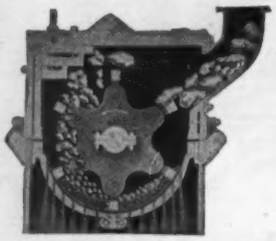

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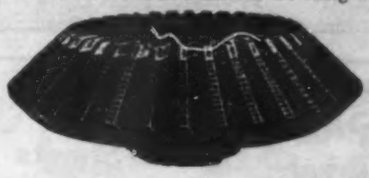

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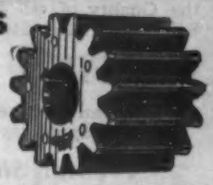

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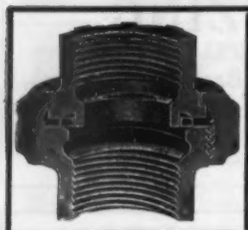

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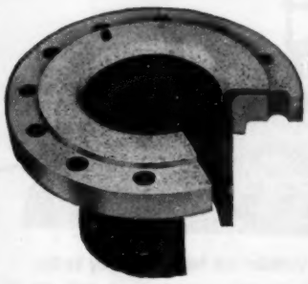

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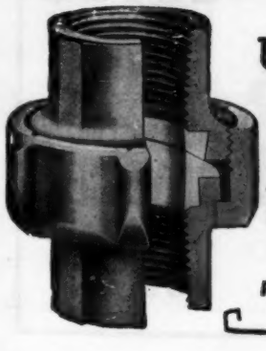

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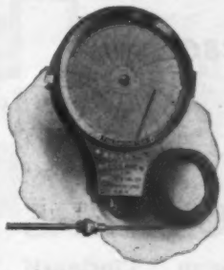

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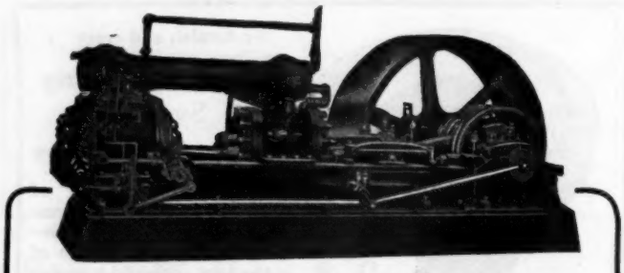

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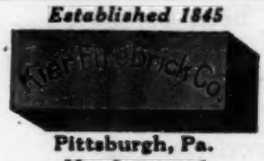

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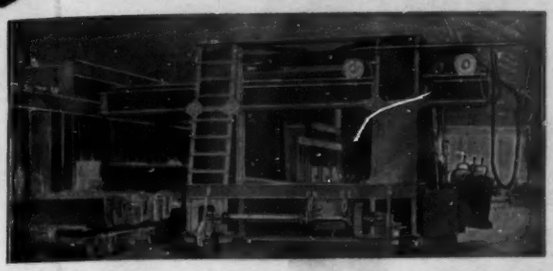

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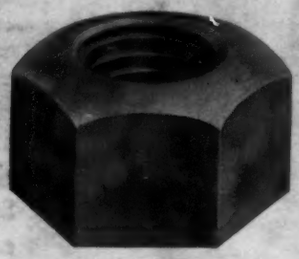

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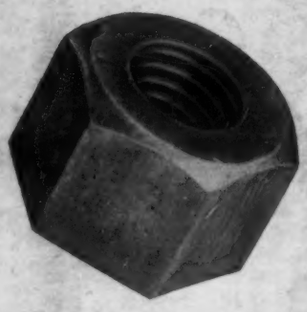

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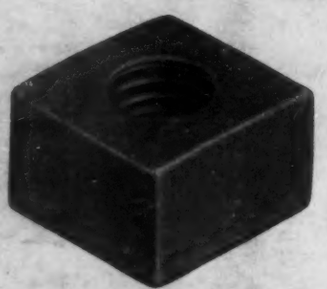

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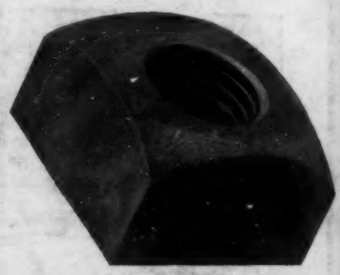

Hot-pressed, square.